



FRIDAY, APRIL 7, 1893.

CONTENTS.

ILLUSTRATIONS:	PAGE.	EDITORIALS:	PAGE.
History and Development of Fixed Signals.....	256	New Publications.....	266
Electric Crane, Grant Locomotive Works.....	258	Trade Catalogues.....	267
37-in. Boring and Turning Mill.....	259	GENERAL NEWS:	
The Development of the New York Triple Valve.....	260	Car Building.....	269
Bolt Heading, Upsetting and Forging Machine.....	261	Bridge Building.....	269
Merrill's Cattle Guard.....	261	Meetings and Announcements.....	269
Fast Express Locomotive—New York Central & Hudson River Railroad.....	262	Personal.....	270
CONTRIBUTIONS:		Elections and Appointments.....	270
Delays in Freight Yards.....	255	Railroad Construction.....	271
EDITORIALS:		General Railroad News.....	272
The Best Metal for Brakes.....	264	Traffic.....	272
World's Fair Rates Still Unsettled.....	264	MISCELLANEOUS:	
The "Ann Arbor" Cases.....	265	Technical.....	267
Editorial Notes.....	264-265	The Scrap Heap.....	268
		Crosses for Railroad Bridges.....	258
		Car Coupler Failures.....	260
		Iron and Steel in the Pittsburgh District.....	263
		The Massachusetts Commissioners and the Boston & Maine Station.....	263

Contributions.

Delays in Freight Yards.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I have read the article on "Delays in Freight Yards" (*Railroad Gazette* March 31), and find that it contains many interesting points as to the cause, and the cure of that enormous drain on the resources of a great railroad system. There are perhaps few interested railroad men,—yes, even the caboose committees,—but could add information on this subject, and what I have to say may help to simplify the matter.

It is well known that division terminal yards especially are grossly insufficient in capacity, and defective in design. It is a common occurrence to see the business in these yards butchered daily, so to speak, with a resulting universal obstruction to business and an enormous expense for switching or shifting. No railroad yard should be constructed without the engineer in charge taking advantage of all the information possible to be gained, from the Superintendent down to the brakemen of the shifting crew; and while it is impossible for any civil engineer to have practical knowledge of all branches of railroading, still so long as he will continue to consider himself lord of all these practical branches, our yards will remain a discredit to intelligent railroad men.

It is undoubtedly correct that all men working in a particular freight yard should be directly under the yardmaster's charge, and the very best men that any division can furnish should be selected for the position of yardmaster, down to brakemen. Observant railroad men have noticed, and perhaps wondered, why a certain shifting crew could do their work in one-half the time that is taken by other such crews. It is an easy matter to find the cause, however. The first are experts in their line of work, each one knowing his duties and doing them on the least hint given by their conductor of what is required, while the latter are that class of railroad men too prevalent on all roads who are usually in trouble or getting there. The yardmaster, if an expert in his line, can facilitate the work when many other men would be continually blocked. No railroad can afford to pay such men sparingly; they are invaluable to the company at any price.

More than one shifting engine in a yard is universally worked at a disadvantage, unless the yard provides a leader for each engine. Far better should each leader have fewer distributing tracks than two or more engines working on the same leader, and the work of one crippling that of the other.

The car inspectors, from the foreman down, should likewise be experts, and as soon as any train arrives on the receiving track, it should have a general inspection while the engines are being changed preliminary to being shifted, so that any cars requiring time to do repairs that would necessitate their leaving the train could be shifted out into the cripple track, and a final inspection completed as soon as the cars are placed on the distribution tracks. In no case, however, should the inspection delay the handling of trains, and if an expert foreman has charge of this work he will plan how to do it. The car checkers can easily do their work without interfering with the quick dispatch of trains.

The case of seven or ten trains being received at one time, as stated in the article, is so different from anything I have ever experienced, that I cannot cipher out by what kind of time-table these trains were brought over the road; if, however, it is an extraordinary case

on account of wrecks, etc., delays in handling them can only be expected, even though extra force is employed.

A great deal of the trouble in our badly planned and badly managed terminals is due to the slipshod manner of handling the freight trains. A freight yard on a railroad is something like a water trough to a horse or a halfway house to a traveler of olden times—force of habit calls a halt. Now, all our first-class roads have through fast freights that have no business going into a division terminal yard. The bulk of through freight is received at large terminals on the system, and is to be delivered at the other end of the system. Any through freight that is put in these trains for distribution on other divisions should be so arranged that the cars will be next the engine, to be distributed at the different points as they are arrived at. If this is done it will not be necessary for these trains to enter the division terminal yards, and they can be inspected while the engines are being changed without any loss of time whatever due to their inspection. It might also be well for the division on which the receiving terminal is located to ship with these fast freights no cars to be distributed along that division, but allow them to be distributed by local trains. A careful consideration of this matter has shown that about eight or nine hours' time could be made by these fast freights passing over four or five divisions of road in this manner. It is evident that this affords enormous relief to these overburdened division terminal yards, and a wonderful saving to the company, as well as inviting a greater amount of business, while at the same time reducing to a minimum its transportation. Of course this entails more shifting to be done in the receiving terminal, but this is just the place where it should be done, where there are no main tracks to be blocked as at these division terminal yards.

The road having insufficient terminals at each end of the system, and trying to compete for the best paying freight business, is, to say the least, doing a gross injustice to the stockholders, and pulling hard against the stream.

A. MORRISON.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The delays of freight in yards is a subject that I think would be difficult to get two opinions alike on. In the first place, there is no yard in the United States big enough for the road to which it belongs. If it had 150 miles of tracks in it, you would be sure to find 150 miles of cars there. Commodious yards and many of them will break up any railroad. A yard of the capacity equal to the ordinary tonnage of the road is sufficient. An intelligent superintendent will handle his traffic to fit his yards. If he blocks his yards he increases the expenses and blocks the traffic. A yard must be in fair working condition, or an embargo is at once placed upon even a reasonably prompt movement of the traffic. An intelligent yardmaster will notify an intelligent superintendent when his yard is blocked so as to prevent the prompt dispatch of his business, and an intelligent superintendent will hold the balance of the traffic out until the yard is in condition to take it.

The greater the capacity of the yard the longer the agony will be prolonged, and just as long as there is space left to chuck anything into, just that long will they continue crowding it. We once had upon this road an important division point, with four long tracks in it; it kept the road "hustling" to keep the freight moving, as they had not room to hold anything. The large yard has been enlarged now to a capacity of 4,000 cars. The "hustling" process has stopped, expenses are greater, freight is delayed and the larger yard is just as crowded as the smaller one was.

In your article you say what the yardmaster should have. Just as long as you furnish him big yards he will want just what he says he wants.

GENERAL MANAGER.

The Development of Fixed Signals on Railroads.

BY ARTHUR H. JOHNSON.

Very soon after the introduction of the steam locomotive and the railroad it became apparent to the people practically interested that some scheme would have to be devised to prevent collisions between trains. I gather from my father, who has been connected with railroad signaling from its earliest days, that the first attempts were confined to a manual code of signals between the trainmen of one train and those of another, or between trainmen and men stationed on the ground. Of course it was soon found that this intercommunication only covered a small part of the field of danger, because it became necessary to indicate to the engineers the position of switches and the right to proceed past foulings points. It is this branch of signaling—in other words the *fixed signals* of railroads—which I propose to treat at the present time.

There were a great number of different designs introduced at first, as each railroad engineer was anxious to have his own idea adopted. Figs. 1, 2 and 4 show a few of these early signals. It was found that the multiplicity of design caused great confusion, and this was carried to such lengths that the safety signal for one line would be almost identical with the danger signal of another; but it was not until the defect had led up to many serious accidents that railroad managers took

up the question with a view to adopting a standard signal meaning the same on all roads.

The result of their investigation was the general adoption of the semaphore signal; that is to say, shapes and forms were abandoned as far as signaling "stop" or "proceed" was concerned, and a position signal by day and color signal by night were adopted. Many men were, however, hard to convince, and some old forms of signals lingered on to this day.

The semaphore is one of the oldest forms of mechanical signals, but Mr. C. H. Gregory has the credit of its introduction for railroads in 1840. The construction was much the same as in our practice at the present time, except that the arm worked in a slot formed in the post, and the colored glasses were carried by a separate frame mounted on a separate pivot as shown by fig. 5. Audible signals in the form of detonators or torpedoes and gongs were introduced about the same time as the semaphore. For some time after the introduction of the semaphore, separate signals known as switch indicators were used entirely for signifying which way the switch stood. One of these switch indicators is illustrated by fig. 3, but this brings us to the commencement of interlocking.

Early in the forties the levers for operating systems of switches and signals began to be concentrated at a central point, with a view to safety and economy, but with this change came a new danger from the liability of the attendant to become confused and throw the wrong lever. After a series of accidents caused by this defect, one of the inspecting officers of the Board of Trade, Colonel Yolland, I believe, refused to open a certain junction until precautions had been taken to prevent conflicting signals. It may be mentioned here that the first attempt at interlocking was confined to the signals; the signals were not interlocked with the switches. The complete interlocking machine was a distinct advance on this.

As far as I can discover, the following gentlemen were foremost in the introduction of interlocking, viz., Messrs. Gregory, Saxby, Chambers and the firm of Stevens & Sons. Fig. 10 shows the first attempt at interlocking the signal and switch operating mechanism. The signals were operated by stirrups and these could only be moved to pull a signal to safety when the switch bar stood in the right position. Complete interlocking was not obtained by this apparatus. There will not be time to describe the great number of machines which have been tried for effecting interlocking of levers, but it will suffice to say that most of them have been discarded and there are now only about a dozen designs in general use. The test for a machine of this kind is the comparative simplicity, compactness and strength of its parts in a large machine. It is an easy matter to design locking for two levers.

Modern locking machines may be divided into two classes: first, those having lever locking or locking actuated direct from the lever; and second, those having latch or preliminary locking. Figs. 8 and 8a illustrate the best lever locking machine. It is the one originally designed by Stevens & Sons in the fifties. This machine is still extensively used, and the recent resignaling of Waterloo Terminus, London, includes a lever machine of this type.

Figs. 7 and 9 illustrate the two foremost machines of the latch locking type, viz., the Johnson and the Saxby & Farmer. In this type of machine, in case a lever is free to be moved, the intention of moving the main lever as expressed by grasping the handle and raising the latch will move the parts and effect all locking of other levers necessary to the safe movement of the lever in question.

The interlocking machine is only part of the necessary apparatus for working a system of switches and signals. There are the necessary outdoor connections, consisting of rods for switches and switch locks, and wires for signals. There are many ingenious devices in connection with these parts, but I shall only mention a few. Fig. 6 illustrates a compound crank for automatically compensating the varying length of a switch rod caused by variations in temperature. It will be obvious that any reversing gear would accomplish the desired result, for instance, the plain swaybeam, fig. 6a, but that has the disadvantage of altering the run of connections to one side.

Several interlocking machines have been devised by inventors for operating switches and signals by some form of power such as electricity, hydraulics or pneumatics, or a combination of them, and I have made tests with several such machines. The fact is, however, that no form of power is necessary, because switches can be worked as far from the signal tower as the safety limit of sight will permit in good practice by the present comparatively simple means. Power interlocking is certainly neither as safe nor as economical in any position as properly designed straight mechanical work. The application of power to the working of switches and signals is by no means new; pneumatic and hydraulic and electric devices were tried many years ago.

It is amusing to think that when switches were first used the two rails were not connected so as to throw simultaneously. The fireman descended from his engine and moved over first one rail and then the other. The man who first connected the two rails together was considered at the time to have made an important invention. Soon after switches began to be worked from a distance. A long bar fixed so as to have its action obstructed by the presence of wheels on the rails, and

* A paper read before the Buffalo Association of Railroad Superintendents, March 16, 1893.

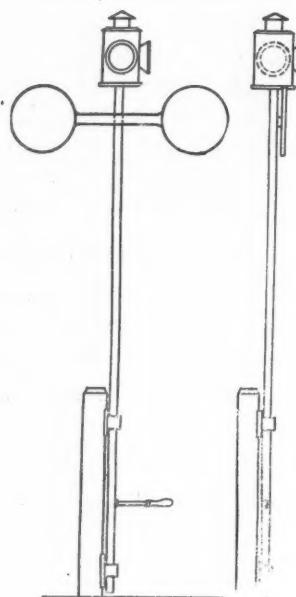


Fig. 1—Early Form of Switch Stand.

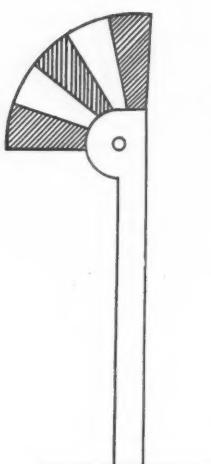


Fig. 4—Early Form of Switch Indicator.

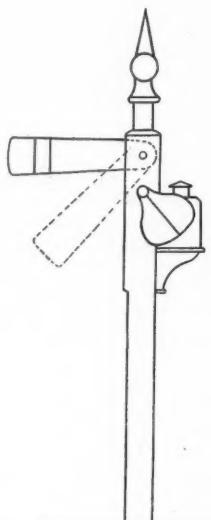


Fig. 5—Early Form of Semaphore Signal.

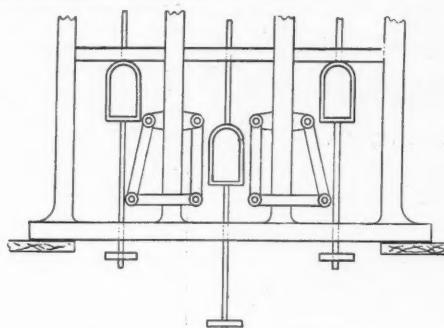


Fig. 10—Early Interlocking Machine.

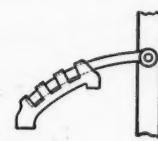


Fig. 8a—Details of Stevens Interlocking Machine

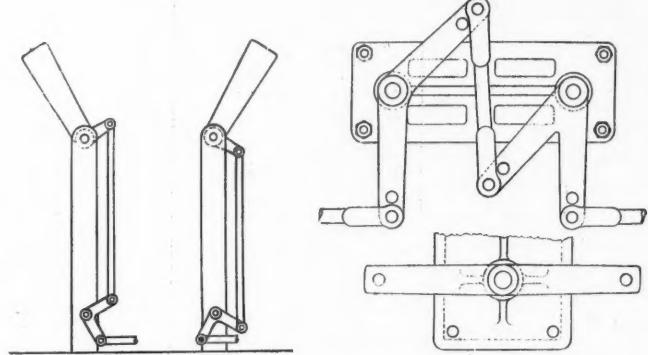


Fig. 3—Early Form of Switch Indicator. Figs. 6 and 6a—Crank Compensator and Reversing Compensator.

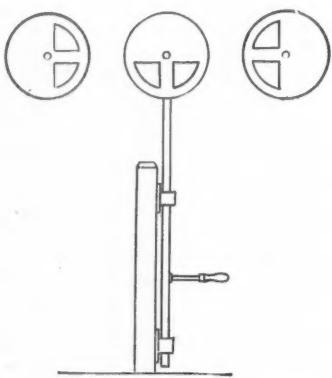


Fig. 2—Early Form of Switch Stand.

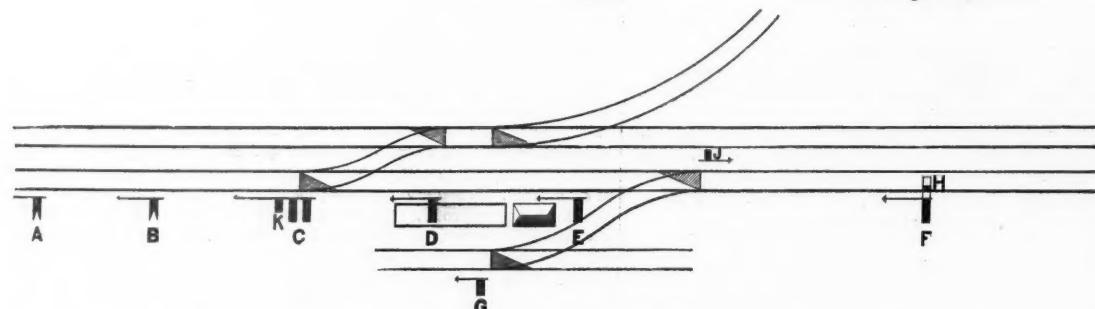


Fig. 11—Conventional Diagram of Station, Showing Different Offices of the Semaphore Signal.

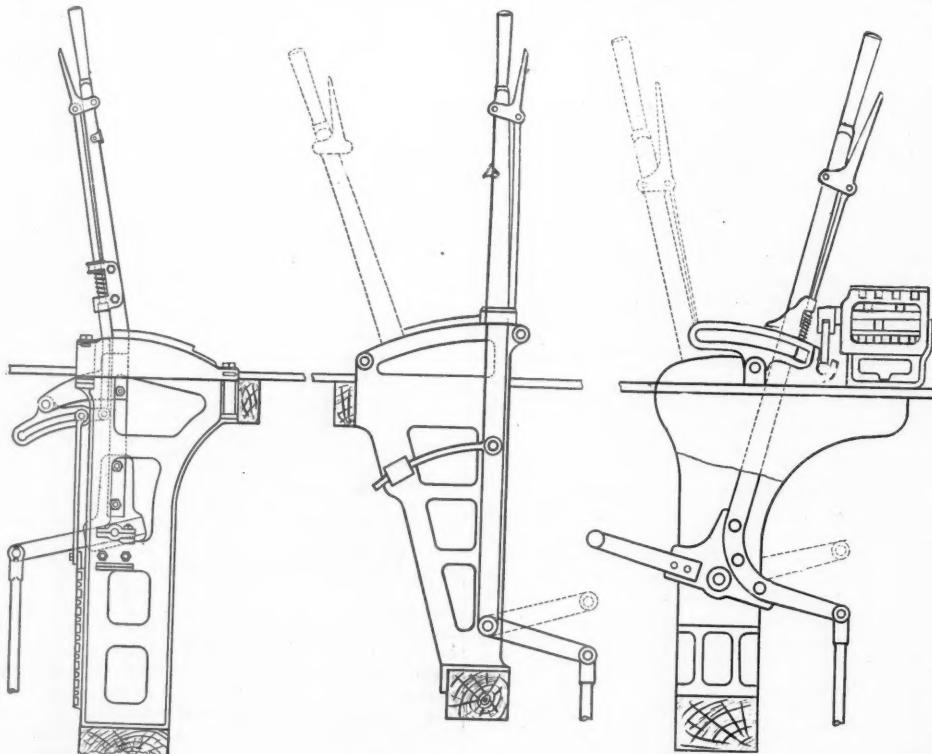


Fig. 7—Johnson Interlocking Machine.

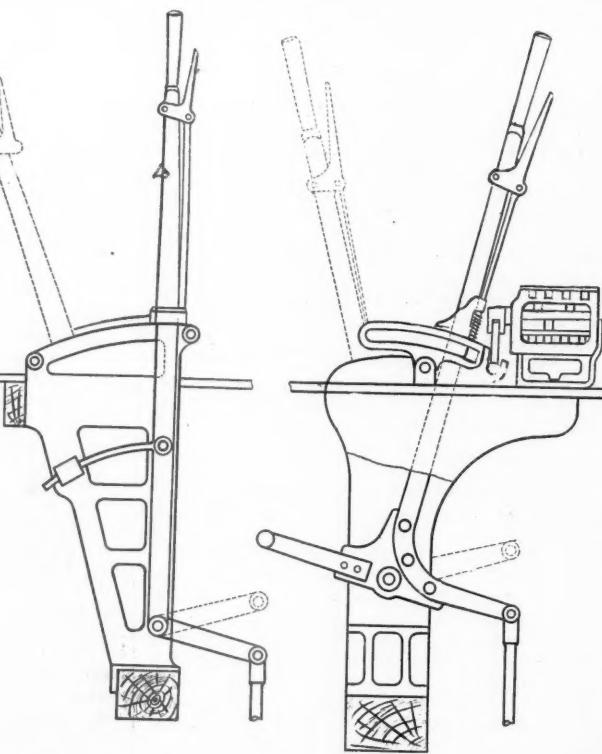


Fig. 8—Stevens, Lever-Locking Interlocking Mach.ne.

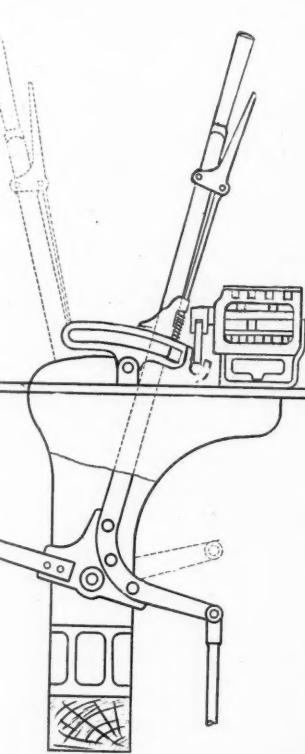


Fig. 9—Saxby & Farmer Interlocking Machine.

HISTORY AND DEVELOPMENT OF FIXED SIGNALS.

known as a detector bar, was coupled to and worked with the switch, the purpose being to prevent the reversal of the switch during the passage of a train. It was soon found that owing to lost motion the detector bar fixed in this way did not prevent a partial reversal of the switch. This led up to the invention of the facing point lock by Lives and Edwards. The invention simply consisted of working the detector bar in combination with a locking bolt adapted to lock the switch in either position by a separate and distinct lever from that oper-

ating the switch. It was not considered necessary to so lock trailing switches, and the "facing point lock" was only applied to facing switches over which passenger trains were run. Hence its name.

Although semaphore signals are all of similar pattern except that distant signals have their ends notched, and large rings are sometimes fixed to siding signals, they may be divided into ten different classes, and they are governed in this respect by their position as relating to switches, stations, etc. These ten classes are named

as follows: First distant, A; second distant, B; rear home, C; home, D; starting, E; advance, F; siding, G; shifting, J; wrong track, H, and calling on K. We seldom find all these classes at any one station. The diagram, fig. 11, shows the relative position of all these signals.

In the case of fast suburban traffic it is sometimes found advisable to have two distant signals the "first distant," in the case of a level track being placed about 3,000 ft., and the "second distant," about 1,500 ft. from the home signal. The advantage of this arrangement is as follows: When a train passes the first distant A at danger, the block section in advance not having been cleared by the previous train, the engineman, of course, brings his train under full control. Before he reaches the second distant B, the chances are that the signalman has received a clear signal from the next cabin in advance, and has placed all his main line signals, including second distant B, at "all clear." This enables the engineman to resume full speed at once, and thus save time in cases where the home and advance signals are obscured by curves, fogs, etc. It will be very desirable to have both first and second distants when we run trains at 90 miles an hour.

The object of the rear home C is to furnish a route signal at the proper point. Home signal D protects a train standing at the platform. Starting signal E is used as its name indicates to start trains from the platform and to cover the fouling made by the siding. Advance signal F, placed a train length in advance of the siding switch, enables a shifting movement to be made under cover of the home and distant signals without entering the next block section. Siding signal G governs the departure of trains from the siding, and shifting signal H is used for moving trains westward, the normal movement on this track being eastward.

The "calling on" arm K is sometimes used to call on a train slowly past the home signal, as far as the signal cabin, in cases where it is not considered safe to clear the home signal.

At some busy yards tracks are regularly used for several hours a day in the wrong direction. It is usual in that case to provide wrong track signals, such as J, which govern these movements, and are suitably interlocked with other switches and signals.

All signal stations should be equipped with three of the above mentioned classes, viz.: distant, home and advance signals, although in this country many roads have been content to dispense to a great extent with distant and advance signals. Where trains are required to run at high speeds it would appear plain that they must be expected to overrun some signals at danger, if distant

signals are not provided, unless a great reduction in speed is made in approaching each station. Advance signals should be generally used so as to enable a signal

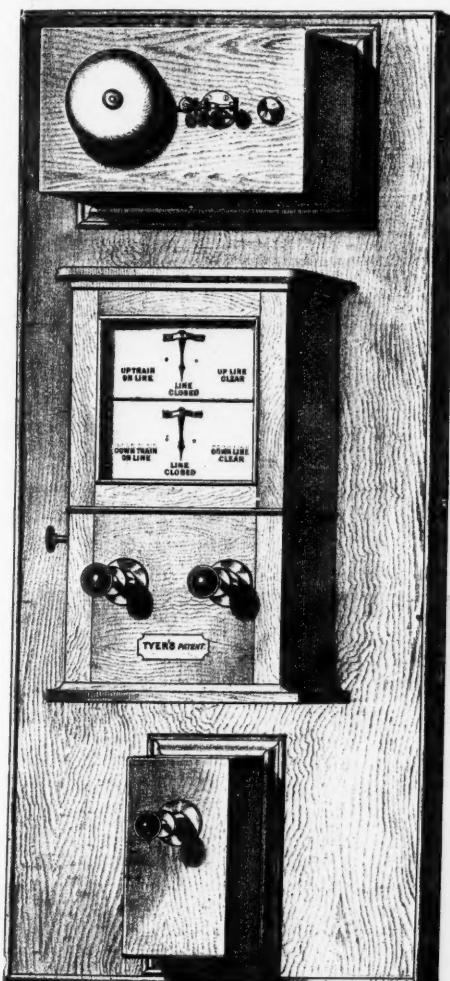


Fig. 12—English Block-Telegraph Instrument.

man to bring a train under the protection of his home signal without giving permission by signal for the train to proceed beyond his jurisdiction.

As stated before, the practice of position by day and color by night for railroad signaling was generally accepted many years ago, and is considered the best practice to-day by most experienced officers. But from the outset next to no importance has been attached in the United States to the adoption of efficient signal lamps. It is a strange fact that our present lamps, although as good as can be expected for their small cost, are little better in construction than a stable lantern. The English roads went through the same experience more than 20 years ago, and it is strange that although the American roads took up the other devices where the English roads left off, they should make such a retrograde movement as regards night signals. It was not for want of an example, for several Saxby & Farmer lamps were in use on the Pennsylvania Railroad more than 10 years. It is to the increase of the intensity of our signal lights by the betterment of our lamps to which we must look for that distinguishing feature so desirable in night signals for fast running, and not to those abortions known as illuminated blades.

There has been a departure of late years from good practice in the matter of color for signal posts. This may appear on the surface a trivial matter, but it is not so. Safety in the use of fixed signals for fast running depends to a great extent on the ease with which they can be picked out by the runners of fast trains. Everyone knows that a white post with black base can be seen under nearly all ordinary conditions much better than one painted black or any color. It has for a long time been the general practice to paint signal posts white. A good many of our friends have of late years lost sight of the object for painting the posts white, and have had their posts painted black, yellow, pink, or according to their sense of beauty. Some few roads have also forsaken the red and white signal arm and now paint theirs yellow and black. There is nothing gained by this change, and the signal arms cannot be seen as distinctly as the red ones.

Speaking of fast running leads to a consideration of the block system of traffic working. As far as I can discover the block system was first introduced on the London & North-Western Railway about the year 1850. The well-known needle telegraph of Cook & Wheatstone had at that time been in use on railroads for some years, and that was the instrument first used for blocking.

Correctly speaking, there is only one block system, and that is the constantly fixed and unvarying space interval as compared with the time limit system. The line to be blocked is divided into sections of suitable length, with proper signals placed so as to govern the entrance to each block section. There are two principles

ways of working the signals. In the way most in vogue signalmen are in attendance, one at each block station. The signaling mechanism by which one signalman communicates to another the necessary information in respect to the passing of trains is very varied, and it is graduated all the way from complete enforcement of harmony in the signal movements to the investment of complete option in the signalman as regards the operation of his machine. I regret to say that common bells and even speaking telegraphs are in use at the present time in this country for block communication, although this was condemned more than 20 years ago.

Figs. 12 and 13 illustrate one type of the common form of audible and visual block instruments used in England. In the construction and operation of this instrument there are several safeguards against error, and I may here point out the obvious safety in having both audible and visual signals in this class of signaling. A signalman can always ascertain the state of a block section by glancing at his instrument.

I would strongly recommend this form of block instrument in connection with those lines where complete interlocking is for the present not obtainable. They are in general use in England and have given and are giving general satisfaction. For very congested traffic and tunnel work I would recommend the Sykes apparatus. This is an offshoot of the before mentioned class of block instruments, and it goes a step further, interlocking with the signal and switch levers in such a manner as to prevent a signal lever from being unlocked for more than one train at a time. In short, by this apparatus, a signalman is prevented from making a mistake and allowing two trains to occupy a block section at one and the same time.

The Sykes apparatus has been adopted by the New

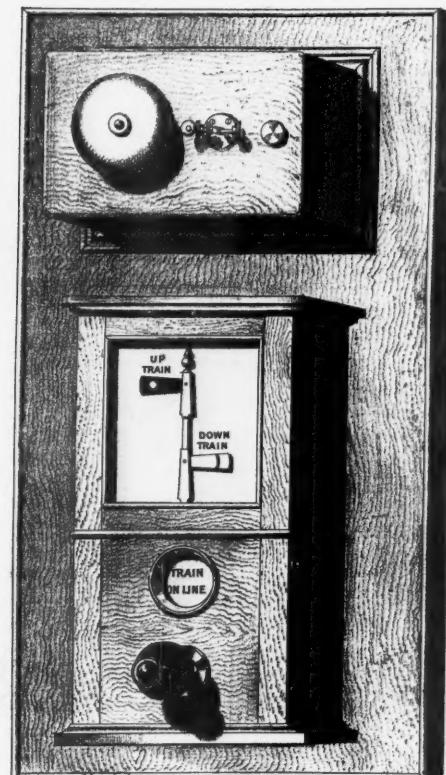


Fig. 13—English Block Telegraph Instrument—Tyer's Patent.

York Central & Hudson River for the whole line from New York to Suspension Bridge and by the New York, New Haven & Hartford from New York to Providence, and the New York, Lake Erie & Western Railroad has it from Jersey City to Turners.

The idea of working block signals automatically by the action of trains originated soon after the birth of the block system, and numerous devices were tried, including track circuit, clockwork, etc. Great efforts have been made to perfect various constructions of automatic block signals. We have learned one lesson from all these experiments, and that is the unreliability of any automatic signal that has parts which are liable to freeze. The Hall automatic signal is probably the most reliable automatic signal extant. All its moving parts are carefully protected from frost and snow. Strange to say, most inventors have made their automatic signals stand normally at safety, in utter defiance of the well known rule that all line signals shall stand normally at danger. The Hall people own a patent for the only means yet invented by which automatic signals are made to stand normally at danger. This is accomplished by auxiliary wire circuits.

It has been proved beyond doubt that block working is more economical than the present mode of working on most of our railroads. We have ascertained that the cost of working the block is more than made up by the average saving in small rear collisions which lay an engine up for a week or destroy several cars. Automatic block signaling has its own special field on American railroad. In fact no one particular form of block work-

ing is in my opinion suited to all the varying conditions under which railroads are operated.

By far the safest way to operate a single track railroad is by means of the Staff system. Under this system an engineman is not allowed to leave a passing station until he has received a staff which is plainly marked as belonging to that section. For a long time this system was not applicable to blocking following trains, but of late years Mr. Edward Tyer and Messrs. Webb & Thompson have devised and successfully introduced machines which contain a number of staves. Complete safety is obtained in this way. Only one staff at a time can be taken out of the machine at station A. This staff must either be put back or carried by train to station B and inserted in the machine at that station before another staff can be issued at either station. Thus only one staff, and, therefore, only one train can have permission to occupy any block section at one and the same time. Means are employed whereby the necessary staves are deposited and received at stations where a train is not scheduled to stop.

In applying the block system to a single track road where very long passing sidings are required for the accommodation of long freight trains the extreme ends of these sidings are often so far apart as to make the government of trains by signal from an intermediate point a very precarious matter. The only good way out of this difficulty, and I think those officers of the Erie who are present will agree with me, is to make the sidings long enough to reach from one block station to another so as to have a signal tower at both ends.

I wish to draw your attention to a general misunderstanding as regards the degree of safety attained by the mere erection of a signal apparatus on a railroad. The opinion seems to be general that a signal is a kind of fetish which will stave off accidents by its presence. Experience, however, has taught us that let a signal apparatus be of the very best design and workmanship, a very great deal depends, after all, upon the careful selection and discipline of the signalmen, or the men who keep the signals in repair. But even then we cannot expect the men to work uniformly without a proper set of rules and regulations. Our present signal rules are very crude, and they should be made to cover all possible contingencies of traffic.

In conclusion, I wish to point out that railroad signaling is not a new art, as many people suppose. On the contrary, it is a twin brother of the locomotive. It is, therefore, quite improbable that any great departure will be made for a long time from the best practice of to-day.

TYER'S STAFF MACHINE.

Each passing station is provided with two of the machines shown in the cut. For instance, station B has two such machines, one for operating the line from A to B, and the other from B to C. The staves of the two machines are not interchangeable. When station B wishes to issue a staff to a train bound from B to A he signals by bell to A, and if the previous staff issued at that station has been properly housed and locked in one of the machines, A can release the machine at B by holding down one of the electric plungers.

The unlocking of the B machine is indicated by an index. B thereupon turns the large knob from left to right. This knob is seen at the top of the case. One staff is thus brought under the opening covered by the lid and it is taken out. This operation changes the electric circuits between A and B, so as to prevent the

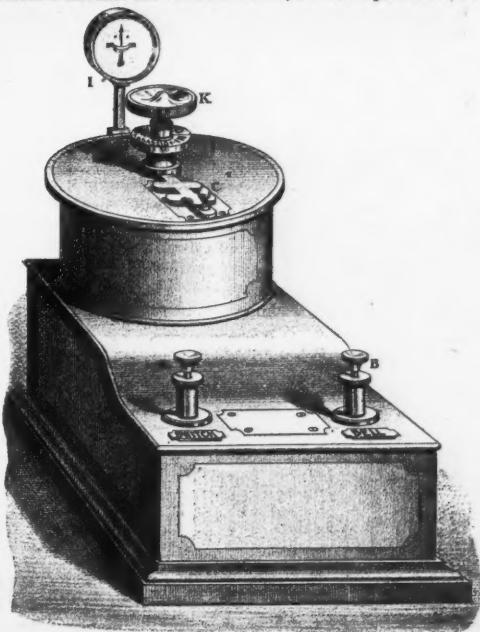


Fig. 14—Tyer's Train Staff Apparatus.

release of A by B until one of two operations has taken place, viz.: (1) The staff thus released at B is carried to A, placed in the machine there and the knob turned from right to left. That action takes the staff away from the opening, and it cannot be turned back again until released by B. This is effected by an automatic pawl, (2) B can release a staff at A by reinserting the be-

forementioned staff which was released by A and turning the knob from right to left, thus relocking that staff. The interchange of staves at speed is effected by placing the staff to be collected in a leather bag and employing similar mechanism to the well known mail pouch apparatus.

Mr. Tyer's ticket machine is constructed on the same lines as his staff machine, the only difference being that tickets are used instead of staves. The Webb & Thompson machine is worked on very much the same principle, the difference being in the mechanical arrangement and design.

TYER'S BLOCK INSTRUMENT.

The cuts, figs. 12 and 13, illustrate the form of block instrument commonly used in Great Britain. Each station is equipped with two such instruments. Some roads prefer the needle index and some the miniature semaphore. I will describe the operation of the semaphore instrument, fig. 13. The small arm seen on the left hand side of the post is worked from the distant station and indicates to the signalman at all times whether there is permission for a train to enter the block section which it governs. This arm is placed at "Clear" or "Blocked" by the operation of suitable plungers at the distant station, seen on the front of the instrument case.

The small arm on the right hand side of the post is simply to fill the important office of repeating the position of the block arm at the distant station. By this

given for the erecting-shop crane. The one in the machine shop has a travel of 350 ft., a speed of 200 ft. a minute, and the trolley has a speed of 100 ft. a minute across travel with full load. The hoisting speed is 7 ft. a minute with full load and 21 ft. a minute with light loads.

Cross Ties for Railroad Bridges.*

In "Cooper's Specifications of 1890," pages 2 and 3, we find the following: "The distance between cross ties on bridges shall not exceed six inches," and "the maximum strain allowed upon the extreme fibres of the best yellow pine or white oak floor timbers will be 800 lbs. per square inch; the weight of a single engine wheel being assumed as distributed over three ties spaced" as above. The weights of engine wheels given in the same specifications are 20,000 lbs. on the Lehigh heavy engine and 25,000 lbs. on the eight-wheel engine. The writer is informed that the C. C. C. & St. L. Ry. have several new 10-wheel engines which have actually 39,000 lbs. on each pair of driving wheels spaced about six feet apart, or 19,500 lbs. every six feet on each wheel. The Lehigh heavy grade of Cooper has its 20,000 lbs. spaced 4 ft. 6 in., and the eight-wheel engine referred to above has its 25,000 lbs. spaced seven feet apart.

The following table is computed from the engine wheel load of 25,000 lbs. distributed over three ties, that is, 8,333 lbs. per tie. To this is added 25 per cent. for the effect of impact, making the load about 10,416 lbs. per tie.

The spacing of the track stringers is made 6 ft. 6 in., 7 ft. 0 in., 8 ft. 0 in., and 9 ft. 0 in. and the fibre strains for 8 in. × 6 in., 8 in. × 8 in., 8 in. × 10 in., 10 in. × 10 in.,

is an advantage, as by the probable greater deflection of the tie in this case we shall distribute our wheel load more uniformly and relieve the track stringer of a portion of the effect of impact. For a spacing of 7 ft. 0 in. we should use not less than 8 in. × 10 in., for 8 ft. 0 in. not less than 10 in. × 10 in., and for 9 ft. 0 in. not less than 10 in. × 12 in. ties.

By using 10 in. × 10 in. ties, 8 in. × 8 in. guard timbers and 80 lb. steel rail we have a floor weighing 385 lbs. per lineal foot of track, or about 15 lbs. less than the usually assumed dead load of floor. The writer does not know of an instance in which a bridge tie has failed by breaking under the load, and does not think there is danger in that direction on account of the margin in the so-called factor of safety.

The spacing of 6 in. required by Cooper should not be increased, but rather should be decreased to 4 in. Many of the closely spaced floors have saved wrecks by preventing, with the help of the timber guards, the bunching of the ties. The writer would use 8 in. × 8 in. guard timbers notched one inch at each tie, and bolted to every other tie, and does not consider any additional interior guards of advantage, unless they are sufficiently far away from the rail to permit the wheels to run between the rail and the guards.

It is suggested that experiments be made to determine the actual deflection, coefficient of elasticity and from them deduce the actual fibre strain in various sizes of bridge ties, and the writer intends to do so at some future time.

DISCUSSION.

ROBERT GILLHAM, of the Engineers' Club of Kansas City: I have for many years been impressed with the view that cross-ties on bridges, viaducts and elevated railroads could be dispensed with and the structures



ELECTRIC CRANE, GRANT LOCOMOTIVE WORKS—CHICAGO, ILL.

Built by THE INDUSTRIAL WORKS, Bay City, Mich.

means the signalman can always tell if the block instrument at the distant station does not stand in accordance with the position of his operating plungers. The audible signals are given by the use of these same plungers, and the signal arms can not be changed without sounding the bell. The bell used is of a specially constructed single-tap pattern, and I have noticed that the signals obtained by this means are more distinct than those given by the common vibrating bell.

Electric Cranes in the Grant Locomotive Works.

The electric cranes in the shops of the Grant Locomotive Works are good examples of first-class modern shop machinery, and a credit to the builders, the Industrial Iron Works, Bay City, Michigan. The Industrial Works built four cranes for the Grant Works, one of 40 tons capacity for the erecting shop, one of 20 tons capacity for the boiler shop, one of 12 tons for the foundry, and one of 10 tons for the machine shop.

The illustration shown was taken from a photograph of the 10-ton crane in the erecting shop. The crane has a travel of 400 ft. in length and its range of speed is between 125 ft. a minute as a minimum, and 250 ft. maximum. The trolley traversing speed is 100 ft. a minute under load. The hoisting speed is 5 ft. a minute for loads approximating the capacity of the machine, and 18 ft. a minute for comparatively light loads. This crane runs above the pits in the erecting shop and does the heavy lifting for the erecting crews. It also runs beyond the pits, over that part of the shop in which the wheel lathes are located and does the lifting for these.

The crane in the boiler shop is like the one in the erecting shop, but its capacity is 20 tons. It travels the whole length of the shop and has the same speeds as

and 10 in. × 12 in. ties, deduced from above loads, are shown in the table:

Size of tie.	Calculated fibre strain.			
	Stringers 6 ft. 6 in.	Stringers 7 ft. 0 in.	Stringers 8 ft. 0 in.	Stringers 9 ft. 0 in.
8 in. × 6 in.	1960	2604	—	—
8 in. × 8 in.	1098	1500	2208	—
8 in. × 10 in.	702	937	1407	1875
10 in. × 10 in.	—	759	1125	1500
10 in. × 12 in.	—	—	780	1040

For calculating the bending moment for above results a lever arm was used equal to the distance from centre of rail to centre of nearest track stringers.

The present practice on many railroads is to use 8 in. × 8 in. ties with 6 ft. 6 in. spacing of track stringers. This gives a fibre strain of 1,098 lbs. per square inch, which is not excessive in consideration of the fact that we have added 25 per cent. to the actual loads. It is not stated in "Cooper's Specifications" whether the 800 lbs. fibre strain allowed by him is made that amount to include impact, or whether we are to add to the loading, as is done above. It appears to the writer that 800 lbs. fibre strain is very small unless the allowance for impact is included, as he has used 1,000 lbs. and as high as 1,200 lbs. per square inch on best white oak.

The question of the actual distribution of the engine loads over the ties is a very interesting one, but it seems not capable of accurate solution. The determination of the rigidity and the deflection of the rail connecting the ties is problem of the greatest difficulty when we consider that the said rail is a continuous girder and the ties are its supports, none of the latter being on the same level under the moving load. It is claimed that the spacing of the stringers further apart than 6 ft. 6 in.

made to serve their purpose better without them than with them. Cross-ties cannot be considered an element of strength in any structure and must be treated as a dead load, for which provision must be made in determining the strength of the structure. If ties can be dispensed with the structures can be proportionately lessened in weight, depending in some respects upon the details adopted in designing the structure, in order to meet the condition brought about by their abandonment. It is true that members could be substituted and details adopted that would result in a marked increase in metal in the structure, but good designing and good details will not result in an increase, but rather in a decrease in weight of structural parts as compared with those having cross-ties. There are structures, however, where this would not apply. Independent of the question of decrease in weight, which, after all, may not be as important to some engineers as to others, a better and more modern design is secured by the elimination of the ties.

In the case of elevated railroads every argument seems to be in favor of the omission of ties. In considering the question in designing the elevated railroad for Kansas City, Mo., it was the opinion of the Edgemoor Bridge Company and the writer, that if a design could be secured that would embrace all the requirements of strength, and meet all the conditions of erection and use, which at the same time would not require the use of the ordinary wood cross-tie, it would result in securing a higher type of modern elevated railroad construction. No one can question the serious objections offered against the New York type of elevated railroads, where cross-ties are used. These ties are the principal cause of darkening the streets through which the roads are built.

Having in mind the objectionable features of roads having cross-ties, the writer made an effort, in building the Kansas City Elevated Railway, to eliminate them, resulting in the designing and erection of a very acceptable structure without cross-ties. The details have, after five years of actual use, proven satisfactory. The train load consists of an engine of 30,000 lbs. and two coaches of 24,000 lbs. each, loaded. No objection has been offered against the structure by property owners on account of the exclusion of light. The noise due to

* From a paper by James Ritchie, member Civil Engineers' Club of Cleveland, read Dec. 13, 1892; printed in the *Journal of the Association of Engineering Societies*, February, 1893.

the passage of trains is very much less on this structure than on the New York structure. Wood cross-ties to some extent tend to enhance the vibrations and sound due to the passage of trains. . . . Cross-ties weigh as much on a bridge as on an elevated railway, and are not an element of strength, but become a dead load that must be provided for. The details developed for one class of structures can very often be applied, with slight modifications, to others.

In the case of the Kansas City Elevated Railway we have a structure composed of a series of pin connected trusses, having no wood cross-ties for rail supports. The trusses average about 48 ft. span. Each rail is supported by a truss, and the trusses forming the single track are tied together by brace frames and wrought iron angle ties. The trusses are supported by cross girders, which in turn rest on columns. The upper chord of each of the trusses is made from two 10-in. channel bars, arranged parallel to each other and 8 in. between faces of channels. The channels are tied together by means of U steel plates, riveted to web or face of channel, 16 in. apart. At each panel point in the truss additional plates are riveted between the U plates and face of channel, which plates extend below the lower side of the channel bars a sufficient distance to allow the making of pin-holes through these plates. Two or more web members of the truss meet at the pins inserted through the plates referred to.

It will be seen that, between the two channel bars, held together by means of the U plates, there is a space of 8 in., in which space the wheel rail is placed resting on the U plates, and fastened by bolts to the same. On the top of each U plate and directly under the wheel is arranged an oak block about 1½ in. thick, having the same width as the U plates. These blocks of wood serve to cushion the rail and assist materially in lessening the noise. The rails move under the bolts by contraction and expansion, independent entirely of the structure. The upper edge of the channel bars of the truss are considerably higher than the top of the wheel rail, and thus we secure an efficient and satisfactory guard rail. The structure has given entire satisfaction.

It will be of interest to consider a comparative statement of the relative weight and cost per lin. foot of the structures with and without crossties:

Length of span, 48 ft.; width, 20.5 ft.; height of truss, 5 ft.; moving load, 21,000-lb. steam motor; followed by 14,000-lb. passenger cars; cost estimated at 5 cents per lb. erected.

Plate Girder Design, One Span.

Wrought iron, 21,300 lbs., at 5 cents.....	\$1,215.00
Crossties and guard rails.....	108.00

Total.....	\$1,323.00
------------	------------

Cost per lin. foot.....	27.56
-------------------------	-------

Lattice Girder Design, One Span.

Wrought iron, 22,700 lbs., at 5 cents.....	\$1,135.00
--	------------

Crossties and guard rails.....	162.24
--------------------------------	--------

Total.....	\$1,297.24
------------	------------

Cost per lin. foot.....	27.02
-------------------------	-------

Truss Girder, One Span, Without Crossties.

Wrought iron, 19,079 lbs., at 5 cents.....	\$953.95
--	----------

Cost per lin. foot.....	19.87
-------------------------	-------

These three designs were made in keeping with a care-

on spruce and cypress, 1,000 lbs. on white pine and hemlock, and 1,200 lbs. on yellow pine and white oak. Practice in general seems to be to use from 1,000 to 1,500 lbs. per square inch, depending on quality of timber and conditions of loading. . . . For ordinary highway bridges I do not think 1,500 or 1,600 lbs. at all excessive. Railroad crossties are, however, different things; they are fully loaded at every passage of a train, and not only that, but they have the load suddenly applied and suddenly released a number of times during the passage of each car, and the effect of this must be quite injurious.

The PRESIDENT: Probably what Mr. Ritchie added to

rolling upon a new set of crossties may produce impact on them, and yet we would hardly call it impact on the whole structure. The structure, as a whole, receives its load gradually, and each successive tie receives it suddenly, modified by the stiffness of the rail above. This question is a pertinent one; if Cooper has not so stated he should have done so. He should not leave the profession in doubt as to whether or not impact is included in his calculations.

Mr. RITCHIE: Mr. President, I should like to know whether any one has ever figured accurately the distribution of loads on a tie. Cooper says it is assumed to

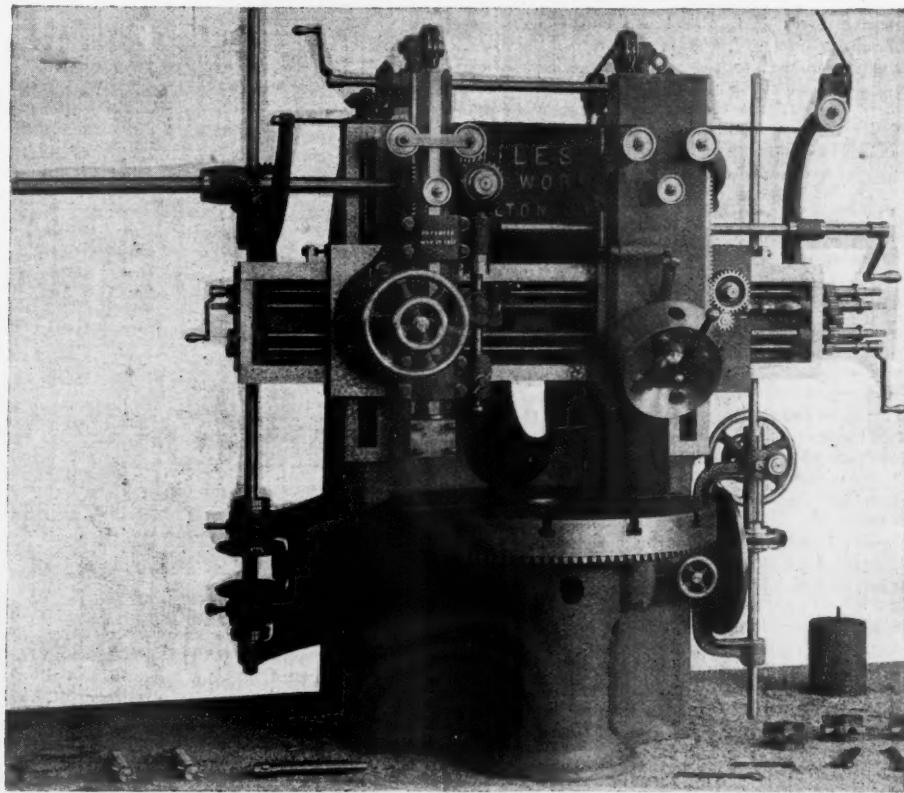


Fig. 2—37-in. Boring and Turning Mill.

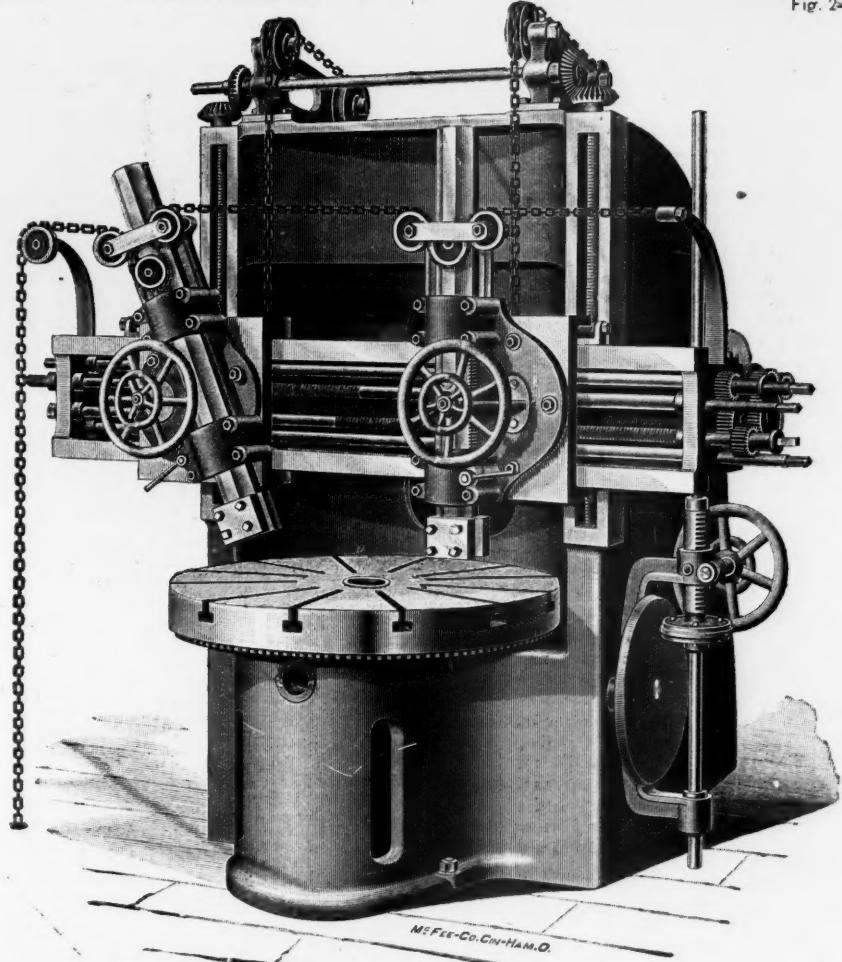


Fig. 1—37-in. Boring and Turning Mill.

Made by the NILES TOOL WORKS COMPANY, Hamilton, Ohio.

fully drawn specification, and were competitive designs.

It will be understood that the difference in cost and weight is not entirely due to the absence of crossties, but is due to designing a structure to meet the conditions brought about by the absence of ties. All structures used for railroad purposes, to my mind, are much higher types of structures if the heavy wood crossties and wood guard rails are omitted.

Mr. OSBORNE: The limit in Mr. Cooper's specifications is 800 lbs. per square inch. Mr. Thaeher allows 800 lbs.

the strain would be produced by ordinary traffic. It is possible that Cooper selected 800 lbs. and included impact in that, so as to ovate allowing anything for impact.

Mr. SEARLES: It occurs to me to say that probably no train rolling over a bridge could be said to produce impact upon that bridge as a whole. Nevertheless, as the weight passes upon the new panel bars, that panel may receive a shock something like impact; therefore, my idea has been that the result of impact is likely to affect the bars rather than the bridge as a whole. An engine

be distributed over three ties, but he don't give any figures for it.

The PRESIDENT: I don't recollect having seen any account of any attempt being made to compute what the strain on different ties would be where they are put together. I am very much in doubt whether much is distributed more than one way. . . . I hardly think that in case the load being over one tie the one 10 or 12 in. from it would receive very much of a load unless the one immediately under the load was considerably deflected. The rail is not very rigid when it is placed on bearings 2 ft. apart. These deflections should be small. In most of our structures nowadays impact is estimated only on comparatively few bars, and those are the ones that are especially liable to the single loading only.

In regard to the stringers that Mr. Ritchie speaks about. I suppose when Cooper made his specifications he had the space of the crossties in mind. In many cases crossties are not spaced, but the fibre strain on the wood is specified so the design will not exceed the limit given in the specifications. I haven't the latest edition of Cooper's specifications; the latest I have were published in 1891. In many specifications the spacing of the stringers is left to the designer. The stringers are spaced for not to exceed 5 or 6 ft. apart, sometimes with outside stringers, occasionally wood, sometimes iron. This method used to be quite common, the outside stringers taking one half as much strain as the stringer immediately under the rail. I presume that is what Cooper had reference to, but he didn't state it.

Mr. RITCHIE: The paragraph I referred to was simply spacing of the crossties 6 in. apart, not the spacing of the stringers. I took the spacing of the stringers three different spaces: 6' 6", 7' and 8'.

The PRESIDENT: I think he left that matter of spacing the stringers for the very purpose that the stringers should be spaced dependent upon the crossties, so the fibre strain should not exceed 800 lbs.

Mr. RITCHIE: The further apart the stringers are the more deflection we have in crossties, consequently the more the crossties act as a cushion for reducing the impact across the bridge.

The PRESIDENT: I expect the stringers are spaced about 6½ or 7 ft. apart.

A 37-Inch Boring and Turning Mill.

The engravings show a new boring and turning mill built by the Niles Tool Works Company, Hamilton, O. Fig. 1 shows the 37-in. mill with two standard heads. The bed, housings and top brace are made in one solid casting, giving a very strong and rigid construction. The table is partially surrounded by the column and light is admitted from the back through the large oval aperture. The cross rail is of the box girder type, is raised and lowered by power and has wide bearings. The saddles are right and left, permitting the boring bars to work close together. The boring bars are rectangular section as in other types of the Niles tools, and may be set to work at any angle. Both are counterbalanced by a single weight so arranged as to make the weight inert when the bar is working on an angle whatever may be the position of one or both of them. The boring bars have a traverse of 18 in.

The driving cone is placed at the back of the mill, has four steps for 4-in. belt, and transmits motion to the table through accurately cut bevel gearing. It is

STATEMENT NO. 1.—M. C. B. COUPLERS AND KNUCKLES BROKEN APRIL 1 TO SEPT. 30, 1892.

Knuckles.	Foreign Cars.													Home Cars.																					
	A	B	C	D	E	F	G	H	I	J	K	Totals.	C	A	G	Total.	Grand Total.																		
No.	Per Ct.	No.	Per Ct.	No.	Per Ct.	No.	Per Ct.	No.	Per Ct.	No.	Per Ct.	No.	No.	Per Cent.	No.	Per Cent.	No.	Per Cent.	No.	Per Cent.	No.	Per Cent.													
Gone.....	31	10	89	31	12	4	1	1	8	6	10	7	39	5	9	4	22	.....	156	14	23	9	5	7										
Pin Hole.....	185	61	70	26	224	85	69	71	8	61	39	61	9	50	47	85	9	50	1	100	661	61	207	80	37	1									
Lug.....	45	15	18	7	21	8	18	19	3	23	7	11	2	4	5	28	.....	121	10	17	7	19	26	1	33	37	11	158	11					
Tongue.....	42	11	86	33	8	3	9	9	1	8	9	15	.....	1	2	.....	.....	.....	156	14	11	4	12	16	1	33	24	7	180	13	
Totals.....	303	263	265	97	13	61	18	55	18	1	1,094	258	73	3	334	1,428			
Coupler.																																			
Arm.....	107	72	26	72	199	86	21	66	5	100	14	70	3	60	3	100	11	100	0	4	100	1	50	394	79	218	91	38	59	1	100	257	84	651	82
Top Lug.....	4	3	1	3	12	5	17	4	5	2	3	5	8	3	25	3			
Bottom Lug.....	5	3	.....	.....	9	4	2	6	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	16	3	5	2	3	5	.....	.....	5	2	21	3
Shank.....	32	22	9	25	12	5	9	28	.....	6	30	2	40	.....	.....	.....	.....	.....	1	50	71	14	11	5	23	36	.....	34	11	105	12
Totals.....	148	36	232	32	5	20	5	3	11	4	2	498	239	64	1	304	802	

two points on coupler 'A.' In the statement of breakages under foreign cars it will be seen that the percentage of 'broken through pin hole' is much larger than under statement for home cars. This is doubtless partly due to a decided change in construction of the knuckles; all the home cars are equipped with the improved design, whereas over 50 per cent. of the foreign cars have the old style.

"A study and analysis of the statements in connection with breakage of the couplers proper show another interesting similarity in all the statements, namely, that the breakage of couplers through the guard arm is about 82 per cent. of the total coupler breakage, or in other words, is equal to four times the sum of all other coupler breakages. This is, above all other points, the great weakness of the M. C. B. couplers, and is really the great source of expense in the use of the M. C. B. type. The paramount importance of this feature of the breakage will be seen when we consider that a broken guard arm means an expense for replacement from two to three and one-half times as much as a broken knuckle. All other breakages of the couplers themselves are comparatively small, the only other material source of breakage being the shank.

"From statement No. 1 it will be seen that there is a marked difference in the various couplers as to the percentage of breakage in guard arm, this percentage run-

a final opinion on the comparative merits of the strength of the couplers proper on the result, as the coupler with rigid steel knuckles has to stand a severity of shock not obtained on the couplers tested with the malleable or wrought knuckles. To properly test the bars themselves, knuckles of equal rigidity should be used. To test the couplers and knuckles complete in a satisfactory manner for comparison, they must be tested in the draft rigging as nearly under the conditions found in service as possible. Then and only then can the shop tests be made to approximate the results of actual service tests.

"In the writer's opinion the most important shop tests needed are the two mentioned by the M. C. B. committee in the recommendations near the close of their reports, namely—1. Guard arm tests; 2. A drop test to represent the shock to which couplers are subjected in pulling. A practical test for these two features will give more actually needed information than all the other drop tests so far required.

"In concluding, let me urge any companies who are considering the M. C. B. coupler question to ascertain, if possible, from practical tests:

"1. The style of coupler having least breakages in knuckles through pin hole or knuckles missing.

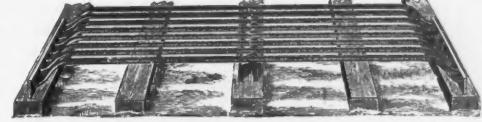
"2. The style of coupler showing least breakage of couplers through guard arm.

Rivets, track bolts and many other forgings are made directly from the rod, and cut to length by a shear provided in the rear of the dies. An outside shear is provided for, which can be used for cutting off work from the bar after forging. A patent relief wedge serves to prevent the breaking of the beds through the feed gap should the operator by accident or carelessness allow cold work to get caught between the dies.

This cut shows the two-inch machine, which weighs complete about 30,000 pounds.

Merrill's Cattle Guard.

The construction of the Merrill cattle guard is shown in the cuts herewith. It is made of steel tee bars $1\frac{1}{2}$ in.



Merrill's Cattle Guard.

$1\frac{1}{2}$ in. turned on their sides. The ends are secured in a bar as shown in the detail, and at the middle they are supported by a plate bent in U-form. Each complete cattle guard consists of four sections of eight rails each, one section being shown in the cut. They can be spliced to the ties at any place in the width of a section and extra-length ties are not required to secure the outside sections. The weight of metal for a single track guard is upward of 500 lbs., and for double track 1,200 lbs. They are said to be very stiff and strong.

One object aimed at is to give the appearance of a pit underneath the guard, the theory being that it must present the appearance of danger in order to deter stock passing on it. Therefore, in addition to the bars being raised above the level of the rail by the U-plate it is recommended to omit the ballast for about half the depth of the ties increasing the visible pit beneath the guard.

The makers say that their trade has doubled within a year, and they now number among their customers a good many of the large railroads, including the Chicago & Northwestern, the Pennsylvania Company, the Wabash and the Delaware & Hudson. This cattle guard is made by the Merrill-Stevens Manufacturing Company, Niles, Mich.

Shop Notes.—Wisconsin Central.

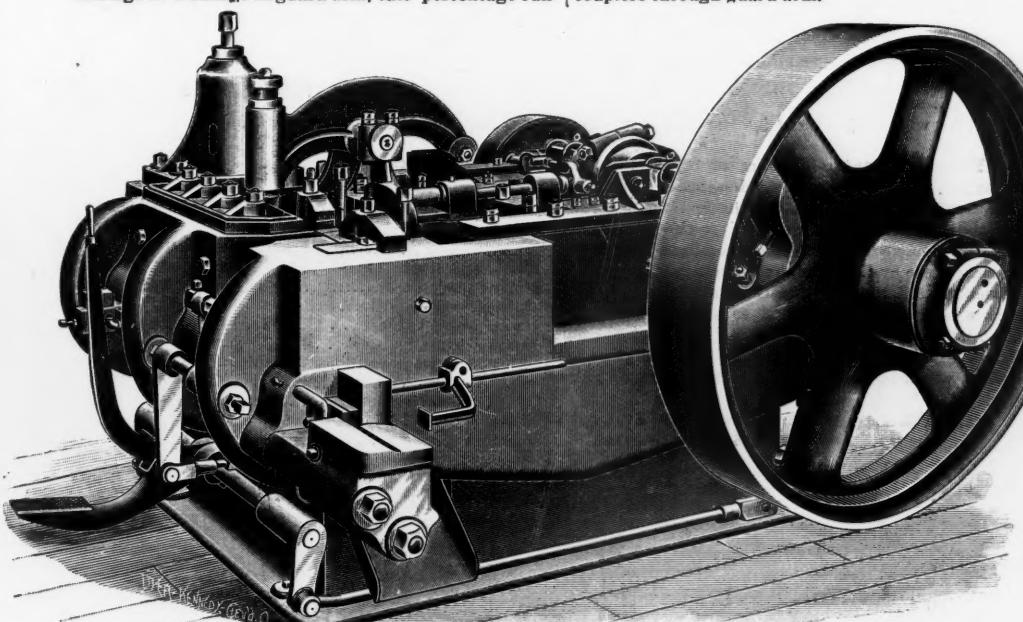
The shops of this company, at Waukesha, are at present specially busy, partly because of the hard winter just passed, and partly on account of the preparations being made for World's Fair traffic. It is believed that the present engine equipment, after some overhauling, will be capable of handling this traffic. The company has, however, lately ordered four consolidation engines and two moguls for the Chicago & Calumet Terminal Railway, and a standard Wisconsin Central engine for the World's Fair display. These engines are from the Brooks Locomotive Works.

Mr. McNaughton has lately equipped his roundhouse with a fire kindler of his own design by which he is enabled to fire up an engine in a much less time and at a much less cost than is ordinarily possible. This device consists of a portable oil burner, which can be attached to a system of piping with which the shop is supplied. Oil is forced to a small tank above each engine and is sprayed from the burner by means of compressed air which is supplied from a Westinghouse air pump in the boiler room. The main reservoir and tank from which the oil is taken is outside the shop buildings. This device has proved itself very efficient. Fires are regularly kindled with an oil consumption of $2\frac{1}{2}$ gallons.

The machine shop is at present quite busy. Facilities for handling work are very good. The shop is supplied with three, one-ton traveling cranes running the whole length of the shop, three five-ton cranes which also traverse the whole length of the shop and two 30-ton cranes driven by cotton belting. These arrangements enable the company to handle any engine in the shop with per-

Bolt Heading, Upsetting and Forging Machine.

Made by the ACME MACHINERY COMPANY, Cleveland, Ohio.



ning from 59 per cent. to 91 per cent. in home cars. An investigation to the cause of this large difference shows it to be largely due to the difference in design. Coupler A, which shows the best result, has been specially constructed to resist to the greatest extent possible, within the limits of the M. C. B. dimensions, the blows and strains which cause breakage through the guard arm."

[Mr. Waitt finds in the coupler the same fact that appeared in the knuckle that the best and the worst results came from nominally the same metal, viz., malleable iron; and that steel couplers show an equally large proportion of broken guard arms. He advises increasing the section of the coupler back of the head and says that the present draft rigging of most roads could admit of widening and deepening the section at least one-half an inch, and in many cases no great inconvenience would be experienced by an increase of 1 in. in width and depth.

"At the 1892 meeting of the M. C. B. Association the committee on M. C. B. couplers recommended a specification and series of tests for the M. C. B. couplers. It is a singular fact that not one of the tests so far given in detail by the committee show whether a coupler or knuckle is deficient in strength in the most vital parts. The pulling test, while it shows the tensile strength and stiffness of the coupler, does not in any way show whether the coupler or knuckle is weak or defective in the parts which are the most extensive source of failure. The drop test, while it may give the resistance of the coupler to crushing or bending, does in no way test the strength of the shank or the guard arm. It is a curious coincidence that some makes of couplers which have shown all results by the drop and pulling tests are utter failures in actual service. To test a coupler properly as to its comparative merits, it seems to the writer necessary to use the same quality of material in knuckles. For example, to test the comparative merits of three couplers, if one is tested with a steel knuckle, one with a malleable and one with a wrought knuckle, it would be unfair to base

"3. The style of coupler where greatest care is used in testing and inspection of material prior to shipment.

"4. The style of coupler having above points and conforming strictly to the M. C. B. lines and dimensions.

"A judgment based upon an investigation on the above lines cannot but give the company a good, safe coupler which can be maintained at a minimum expense."

Bolt Heading, Upsetting and Forging Machine.

The engraving shows a new improved built heading, upsetting and forging machine, built by The Acme Machinery Co., of Cleveland, Ohio. The bed is made in the box form, with three deep trusses running through its entire length. The crank shaft which is made of forged iron is carried in three bearings; the face of the bearings being inclined toward the front of the machine, brings the thrust of the forging tools and die closing mechanism against solid metal, and relieves the main caps and cap bolts from all strain. None of the parts, subject to wear slide directly upon the bed of the machine, but upon steel and phosphor-bronze strips or ways, which may readily be removed to be tried up or replaced, thus saving the trouble and expense of dismantling the entire machine and taking it to the machine shop, should repairs be made necessary by such wear as does take place.

The machine is also provided with a cushion clutch stop motion, so that when making special forgings, one or more blows can be given, as may be required to finish the work. The dies and punches are of novel construction, and will turn out square and hexagon head bolts in three blows or revolutions, of the machine.

fect ease. The travelling cranes have a span of 60 ft. and 1 in. and are equipped with the Yale & Towne self-sustaining mechanism. The greater part of the machine tools in this shop are from the Bement, Miles & Co. The transfer table just outside of this shop is operated by a Blake 15-H. P. motor, taking current from an overhead trolley. Current for this purpose, as well as for lighting the shop, is furnished by an Edison dynamo.

Oil is used quite extensively in boiler and blacksmith shops for welding flues, tempering springs, and other work. The fire protection is afforded by a large Smith & Vail Duplex pump, from which mains lead all over the works. Power for the carpenter shop is taken from shafting underneath the floor, thus keeping all belting below the machines and permitting greater freedom in handling work. Power for machine shop, carpenter shop and blacksmith shop is taken from an 18 x 48-in. engine built by C. H. Brown & Co., of Fitchburg, Mass. This engine has been in use for nearly six years and appears to be in as good condition as ever.

The tool room in this shop is very well equipped with special tools for the work generally required. Mr. Porter who has charge of this room has inaugurated a system of checking and classifying tools that permits the work of the tool room to be handled very satisfactorily and economically.

The car shops of this company at Stevens Point are especially busy. Mr. Cormack, Master Car Builder of the company, is at present building 50 cars for local World's Fair traffic. They are to be run jointly with those which the Baltimore & Ohio are now building at the South Baltimore Car Works in the suburban service between the World's Fair grounds and points along the Wisconsin Central line. There are also in the course of construction in these shops several baggage cars for use in through service on the Chicago & Northern Pacific lines. The repair shops are engaged in refitting and overhauling parlor cars, coaches and sleepers of all descriptions.

New York Central Fast Express Locomotive.

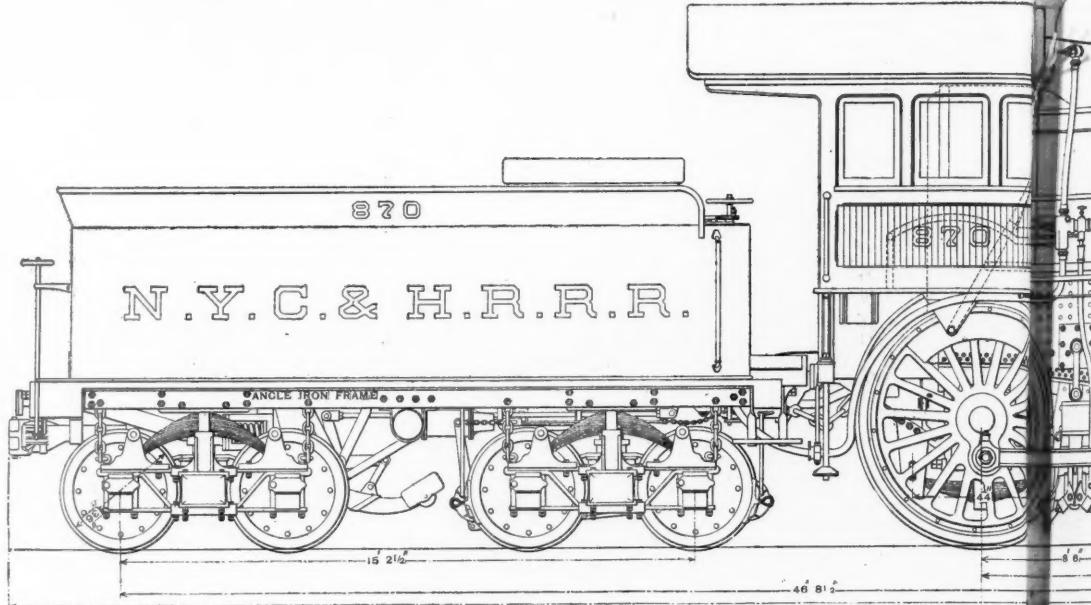
The eight-wheel American type locomotives on the New York Central Railroad are interesting on account of their size and power, and, because they haul the Empire State Express, of which we have written before. See *Railroad Gazette*, Oct. 30, 1891; Feb. 26, 1892; April 15, 1892; May 6, 1892. They will soon attract still more attention on both sides of the Atlantic, from the fact that the officers of the New York Central and the Lake Shore have practically decided to put on a train making the run from New York to Chicago in 10 hours; although the operating details are not yet settled. This means a speed from terminus to terminus, including stops, of 50.8 miles an hour, for 965 miles. (We give the shortest distance possible by the Lake Shore as closely as we can get it.)

These locomotives are known as the "800 class." The line drawing and the engraving from a photograph, which accompany this, give a pretty clear idea of the construction. The engines weigh, when loaded ready for duty, 126,150 lbs., of which 81,400 is on the drivers, leaving 44,750 on the front truck. This heavy weight

riding and satisfactory truck connection for tenders. The tanks are fitted with a water scoop, as shown, and have the Gould automatic vertical plane coupler.

These engines have been very successful from the start, having good steaming capacity, and almost as much hauling power as the 10-wheel express engines used in the western part of this country. The 10-wheelers weigh on drivers about 90,000 lbs., while these eight-wheelers weigh 81,400 lbs. They make the highest average speed for long distances on regular schedule time of any engines in this country. The detailed account of the first run made to determine whether this schedule could be made was given in the *Railroad Gazette*, Oct. 30, 1891. The official timetable now gives the time as 170 minutes from

Kind of piston packing.....	Cast iron rings.
" " " rod packing.....	U. S. metallic.
Diam. " "	3½ in.
Size of steam ports.....	18 in. x 1¼ in.
Size of exhaust ports.....	18 in. x 2¾ in.
Slide valves, greatest travel.....	5½ in.
" " lap outside.....	1 in.
" " inside.....	0 in.
" " lead in full stroke.....	7/8 in.
" kind.....	Richardson balanced.
Kind of valve stem packing.....	U. S. metallic.
Diam. of driving wheels outside of tire.....	78 in. Tire held by shrinkage and retaining rings.
Diam. and length of driving axle journal.....	8½ in. diam. x 10½ in. long.



FAST EXPRESS LOCOMOTIVE—NEW YORK CENTRAL

Designed by Mr. WILLIAM BUCHANAN, Superintendent of Motive Power.

New York to Albany, a distance of 142.88 miles, and Albany to Buffalo, 350 minutes, a distance of 296.64 miles, or 439.52 miles at the rate of 50.7 miles an hour, including four stops, two of five minutes each to change engines.

Mr. Buchanan has sent us the following statement of fast runs made by the "Empire State Express":

March 28, 1892, the run from Oneida to De Witt, 21.37 miles, was made in 17 min. and 40 sec., an average of 72.69 miles per hour.

July 25, 1892, a run of 101 miles on the Hudson River Division was made at an average rate of 61 miles per hour.

Sept. 26, 1892, the run from Irvington to Albany, 120 miles, was made at the rate of 60.5 miles per hour.

Diam. engine truck wheels..... 36 in.
Diam. and length of engine truck axle journals..... 6 in. diam. x 10 in. long.

Diam. and length of main crank pin journals..... 5½ in. diam. x 5½ in. long.

Diam. and length of side rod crank pin journals..... 4½ in. diam. x 3½ in. long.

Springs, length of driver, centre to centre of hangers..... 44 in.

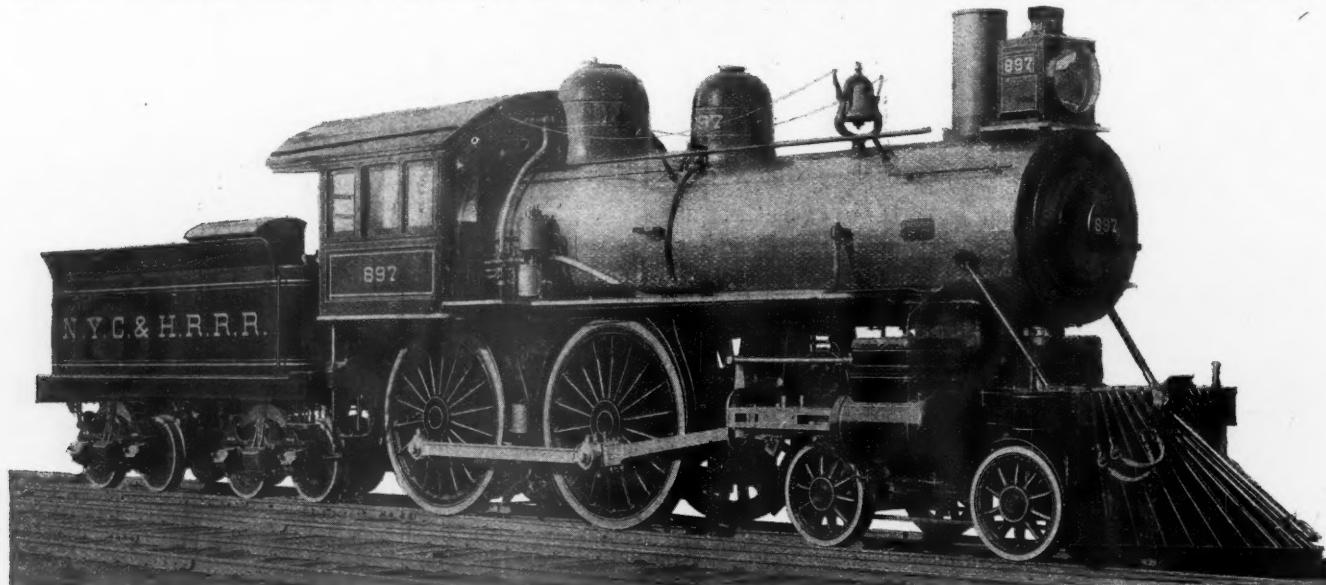
Driving boxes, material..... Ajax metal.

Working steam pressure..... 180 lbs. per sq. in.

Style of boiler..... Wagon top.

Diam. of first ring outside..... 58 in.

Plates in waist and outside of firebox..... Steel, 7/8 in. thick.



FAST EXPRESS LOCOMOTIVE—NEW YORK CENTRAL & HUDSON RIVER RAILROAD.

on the truck is carried on large journals 6 in. diameter by 10 in. long. The truck wheels are 36 in. diameter. The fireboxes are placed on top of the frame and are about 8 ft. long by 3 ft. 5 in. wide. The fireboxes slope toward the front, as is clearly shown in the line drawing. The general dimensions of the engines are given below.

The driving wheels have cast iron centres and the tires are held on by retaining rings. The driver brakes are of the spread pattern. The driving springs are hung underneath the axle boxes and the equalizer is under the frame.

The tender frame is of angle iron bolted together. The tender is hung on swing links at the sides of the trucks, as is clearly shown, which makes a very easy

Oct. 14, 1892, the run from Syracuse to Buffalo, 148.80 miles, was made at the rate of 59.5 miles per hour.

Nov. 8, 1892, the run from Syracuse to Utica, 51.67 miles, was made in 46 minutes, an average rate of 67.38 miles per hour. Also from Chittenango to Schenectady, 110.16 miles, run in 110 minutes, an average rate of 63.38 miles per hour.

With the type of this engine all railroad men here are familiar, and owing to the simplicity of the design the repairs are very small in proportion to the heavy work done. The following are the general dimensions:

Diam. of cylinder and stroke of piston..... 19 in. diam. x 24 in. stroke.
Horizontal thickness of piston..... 5 in.

Horizontal seams..... Quadruple riveted with welt strip inside.

Circumferential seams..... Double riveted.

Size of firebox inside..... Length, 96½ in.; width, 40½ in.; depth, F. 70⅓ in., B. 58⅔ in.

Plates in inside of firebox..... Steel. Tube, 3/8 in.; crown, 3/8 in.; sides and back, 7/8 in.

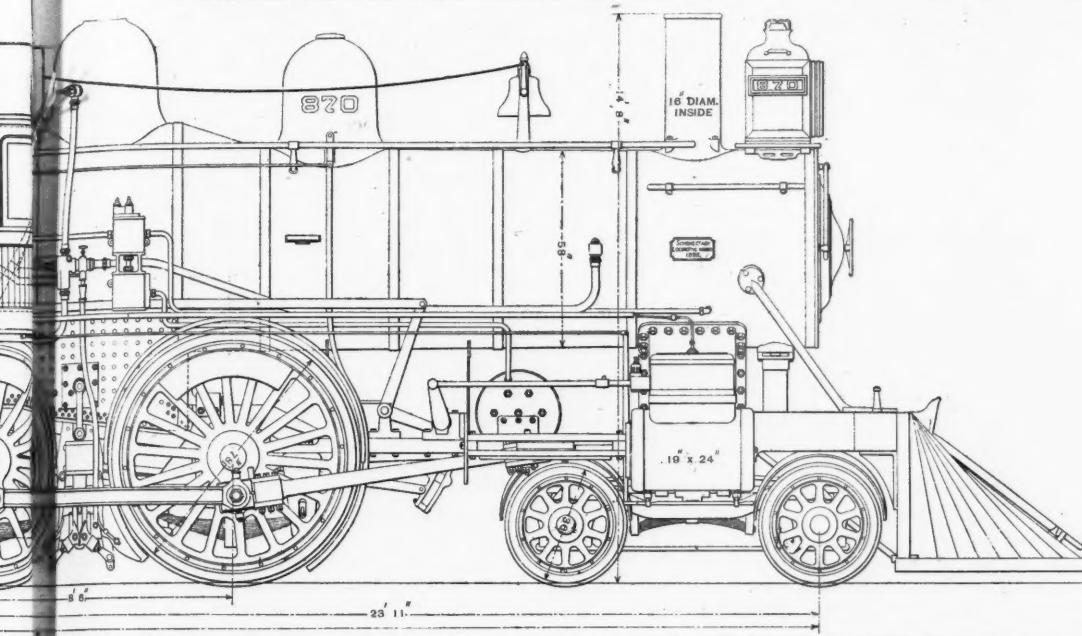
Water space around firebox..... Front, 4 in.; sides, 3 in.; back 3 in.

Crown stays..... Two 5 x 3/4-in. bars welded together at ends.

Tubes, material..... Charcoal iron.
" number of..... 268.

TABLE WITH NEW YORK CENTRAL FAST EXPRESS LOCOMOTIVE.

Name of operating railroad.	Where or by whom built.	Type and class.	Weight on drivers, Lbs.	Diam. drivers, Inches.	Diam. c'lind'rs, Inches.	Stroke of pistons, Inches.	Boiler pressure, lbs. per sq. in.	Weight of tender, loaded, Lbs.	Weight on engine truck, Lbs.	Total weight of engine, loaded, Lbs.	Remarks.
Pennsylvania.....	Altoona, P. R. R.....	8 wheel, 4 coupled.....	73,350	68	18½	24	160	65,500	33,150	106,500	Class "P"; anthracite.
Chicago, Burl. & Quincy.....	Aurora, C. B. & Q.....	8 " 4 "	65,400	68	18	24	160	73,350	38,200	103,600	" " O"; bituminous.
Chicago, Milw. & St. P.....	Mogul, 6 "	91,500	68	19	24	165	71,000	18,500	110,000	" " H";	
Schenectady Loco. Wks.....	10 wheel, 6 "	84,800	62	18	26	180	71,000	32,200	117,000	Bituminous.	
Rhode Island " "	10 " 6 "	84,590	64	19	24	180	68,000	28,770	113,360		
Baltimore & Ohio.....	Baldwin Loco. Works.....	8 " 4 "	77,000	78	20	24	110	80,000	37,000	114,000	"
Philadelphia & Reading.....	" "	8 " 4 "	70,000	68½	21	22	160	82,200	36,000	106,000	Wootton firebox; anthra-
Central of New Jersey.....	" "	8 " 4 "	83,400	78	13 and 22	24	180	82,000	35,400	123,800	Anthracite; compound,
New York Central.....	Schenectady Loco. Wks.....	8 " 4 "	81,400	78	19	24	180	80,700	44,750	126,150	Empire State Express.



W CENTRAL & HUDSON RIVER RAILROAD.

Built by the SCHENECTADY LOCOMOTIVE WORKS, Schenectady, N. Y.

Tubes, outside diameter.....	.2 in.
" length over tube sheets.....	12 ft.
Heating surface tubes.....	1,670.7 sq. ft.
" " firebox.....	147.7 "
" " total	1,818.4 "
Grate surface.....	27 3 "
" style.....	Rocking,
Ash pan, style.....	Sectional, with dampers F. and B.
Exhaust nozzles.....	Double.
" " diameter of.....	3¾ in.
Smokestack, inside diam.	16 in.
" top above rail.....	14 ft. 8 in.
Boiler feeder.....	Two Monitor injectors, placed right and left.
Tender:	
Weight of tender, empty.....	38,600 lbs.
Wheels, number of.....	8.
" diam.....	36 in.
Journals, diam. and length	4½ in. diam. × 8 in.
Total wheel base of tender.....	15 ft. 2½ in.
Style of tender frame.....	S. L. W. standard, 6½ × 4½ in. angle iron.
Style of trucks.....	4-wheel, side bearing, wood bolster, front and back.
Water capacity.....	3,500 gallons.
Coal "	6¾ tons.
Total wheel base of engine and tender.....	46 ft. 8½ in.
Total length of engine and tender.....	57 ft. 1¾ in.
Total weight of engine in working order.....	126,150 lbs.
Total weight on drivers.....	81,400 lbs.
" wheel base.....	23 ft. 11 in.
Driving wheel base.....	8 ft. 6 in.
Rigid wheel base.....	8 ft. 6 in.
Fuel used.....	Bituminous coal.

The table herewith gives the comparative dimensions of the Empire State Express engine and other heavy eight-wheeled engines and some ten-wheeled engines used in passenger work in this country.

The Massachusetts Commissioners and the Boston & Maine Station.

The Massachusetts Railroad Commissioners have made a scathing report to the legislature on the negligence of the Boston & Maine Railroad in not complying with a law passed in 1887 requiring that road to build a union station on the north side of Boston for the use of itself and the Fitchburg road. This report is made in pursuance of a resolution recently passed by the legislature, and is part of the general movement to improve "rapid transit" facilities in Boston and to and from its suburbs. Innumerable hearings have been held and every phase of the subject has been aired in the newspapers. It is not exactly clear, however, what good will come from the Railroad Commissioners' report. It is severe, and probably justly so, on the dilatory behavior of the road, but some of the excuses for not building the station are more or less reasonable, and as long as the

state bears no part of the expense of making this radical and costly change, it is difficult to see just how the legislature can hasten matters much. Its mandates to the railroad company have to deal with such a complication of interests that the road will never be at a loss for legal devices to stave off action.

The Railroad Commissioners' report, as printed in the Boston papers, states that the Boston & Maine was ordered by the law to prepare plans and to agree with the Fitchburg as to details. The excuses presented are: (1) Doubt as to the location of the station. (2) Demand of the Fitchburg for too many tracks. (3) The order of the Secretary of War for the alteration of the bridges across Charles River. The Commissioners brush away the first claim as sophistry. The Fitchburg had a right to insist on six tracks in the station as it agreed to the acquisition of the Boston & Lowell by the Boston & Maine in consideration of this concession. The order of the Secretary of War was not issued until a year and a half after the law was passed. Moreover, that order is just as much an obstacle to the improvements now being made as it was to any of the plans discussed in 1887. The Commissioners animadverted with great force on "the unsightly, ugly mass of ramshackle pile bridges in various stages of decay" which now obstruct the Charles River. These pile structures, used for side tracks as well as main tracks, occupy 25 or 30 acres.

"Originally of much less extent, they have been widened and pieced out from time to time, joining new work to old, and have been patched and repaired, until the bents of piles run in zigzag lines and at divers angles with the channel and flow of the tide, and the conglomerate structures, in various stages of age and decay, have been fitly described as 'hulks of piles and timber.' In point of unsightliness, and as specimens of engineering work, they are a discredit to the railroads, the city and the commonwealth."

They are costly to maintain and require the most careful inspection. A few years ago one of them broke down under an empty passenger car, and a workman was drowned. Professor Swain made a sharp report at that time. Gen. J. G. Foster, of the United States Army, 20 years ago, found that these piles occupied four-fifths of the waterway, and that this waterway was important to the usefulness and integrity of the harbor. The depth of the harbor has been actually decreased to a serious extent by the existence of these and other bridges. The Boston & Maine has, however, engaged to comply with the requirements of the War Department within a definite time, and the conclusion of the present report is:

"To spend money upon a station in the old location, one-half of whose site must consist of a precarious pile structure covering the deepest channel of the Charles River, and which the builder is bound by the mandates of law and obligations of its own contract to tear away in a few years at the most, would seem to be as inconsistent with corporate prudence as it is with the interests of the public."

We have seen no defense of the Boston & Maine against the accusations in this report. While the Commissioners make no recommendation more definite than

that which appears in the foregoing paragraph, they evidently hold that the existing passenger stations should have been used until the contemplated new and large terminal west of Nashua street could be completed, and this, of course, means that preparation for this large station should be begun at once. But it is not certain how seriously the railroad company contemplates building such a station. We believe it has made no promise in the matter more definite than the general statement by President McLeod, in an after-dinner speech, that the road would do justice by the city of Boston. At this distance it looks as though the terminal which has now been begun (shown in the *Railroad Gazette* of March 31) was needed as a temporary relief, pending the construction of the Leverett street station, even if we assume that that station can be made ready in the short space of three years. At the same time it is not to be denied that the new bridges and other changes necessary in making the approach to the temporary station will be costly. We do not know the motives of the railroad company in the matter, but if we may judge by general principles, as illustrated in other cases of the kind, the Boston & Maine evidently aims to retain the terminal grounds, on which the passenger is now being constructed, for use as a freight station, and therefore intends to take every available measure to retain its hold on the ground rights involved.

Iron and Steel in the Pittsburgh District.

The Carnegie company is evidently expecting a "boom," judging by the improvements making or to be made at four of its plants, those at Braddock, Duquesne, Beaver Falls and Homestead. The expenditures for betterments at the last named mill alone amount to over \$1,000,000, and the total will be at least \$2,000,000. The capacity of the blooming department at Braddock is to be doubled by the addition of two immense heating furnaces. Big foundry and machine shops, furnishing work for two hundred more men, are also building. The Carnegie company intends to make its own castings hereafter, including rough rolls. The nine blast furnaces (there are only twenty-six in the entire Pittsburgh district) are all in operation.

The record was broken in the converting mill last Saturday, 1,300 tons of billets being turned out in 24 hours. The manufacture of rails was resumed on Monday morning, and it is said that the orders from the trunk lines are large enough to keep the plant going for the rest of the year.

The Duquesne Steel Works of the Carnegie company will be shut down for six weeks from April 3. The capacity is to be more than doubled, and while the plant at present is adapted to the manufacture of billets alone it is proposed to make steel rails also. Three new converters of 15 tons' capacity each are to be substituted for two 8-ton converters. Two blast furnaces are to be erected also, the first at Duquesne.

The Carnegie company has ordered a new press for the armor plate works at Homestead. It will cost over \$1,000,000, and will have a capacity of 16,000 tons and will be made by Whitworth & Co. The receipts and shipments at the Homestead plant are in excess of the business done before the strike. The receipts average about 165 cars daily and the shipments are nearly as large. A blockade of cars at the works is an everyday sight.

Orders for more than a year ahead have been received by the Keystone Bridge Works.

The Totten & Hogg Foundry Company has closed a contract with James Callahan, of Des Moines, Ia., for all the machinery for an iron mill to be erected at Durango, Mex. This Pittsburgh firm has also received orders for additional machinery from the Minneapolis, Minn., Rolling Mill Company; American Tin Plate Company, Elwood, Ind.; Licking Rolling Mill Company, of Covington, Ky.; and the Colorado Fuel & Iron Company, of Denver. The Gantier Steel Company, of Johnstown, Pa., is adding a new building for the manufacture of merchant steel, which will provide work for 100 new men. The Tyler Tube Works, at Washington, Pa. (removed from Boston, Mass., two years ago) is to be doubled in capacity. It now employs about 270 men. All the wrought iron pipe (or tube) mills in the Pittsburgh district are in operation, having orders far ahead, some for eight months to come. The daily output is not less than 1,500 tons and the weekly shipments will average 450 car loads.—*Pittsburgh Correspondence New York Evening Post.*

Electricity in Bridge Works.

Devices for the transmission of power by electricity are being designed for so many manufacturing plants nowadays, where it is desirable to avoid heavy shafting and belting, that it is not surprising to learn that bridge companies are beginning to give their attention to the subject. The Wrought Iron Bridge Company has had in use for a few months in its shops at Canton, O., a system of electrical power transmission which is said to give good satisfaction. It will be interesting to see an official report of the results and a description of the system itself. Something of this kind is reported to be in process of preparation and will soon be made public.



ESTABLISHED IN APRIL, 1856.
Published Every Friday,
At 73 Broadway, New York.

EDITORIAL ANNOUNCEMENTS

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN OPINIONS, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

On another page we publish a paper from a recent number of the *Journal of the Association of Engineering Societies* on crossties and bridge floors. We do not propose to take up the cudgels for Mr. Cooper, who is amply able to say for himself all that is necessary, but it is only fair to say that a bridge floor without crossties, similar to the one described by Mr. Gilham, was the first floor put down on the railroad part of the Eads bridge at St. Louis. This floor was a nuisance in operating. It furnished no standing place for trainmen or others when there was any work to be done on the bridge, as, for example, coupling up a car in case a train broke in two, or getting it on the track again in case of derailment, or, in fact, meeting any of the emergencies which are sure to arise in operation. It was found necessary to fill the open floor with a makeshift of longitudinal timbers between the rails, and when the new floor was put in some years later it was constructed with longitudinal stringers and crossties.

"The problem [of a satisfactory code of train rules] can only be said to have been definitely solved when trains can be run frequently, at high speed, from start to finish, without time card or train order. . . ." These words, from the closing paragraph of President Haines' address at the last meeting of the American Railway Association, would make a very appropriate text for the discussion at the meeting of the Association in Chicago next Wednesday. They very aptly epitomize the benefits to be derived from adopting the block system. Until we put the thought in this way, we do not realize what a radical improvement is made when we adopt a system which renders the time table, *as a means of safety*, entirely unnecessary. Collisions occasioned by failure of watches are now of rare occurrence, but the fact that they do now and then happen reminds us how extremely difficult it is to enforce rules of safety in the use of watches—that is, the rule requiring two or more persons to consult different time-pieces whenever the safety of a train movement depends upon time; and should lead us to appreciate in some degree what a delicate lot of machinery we are depending upon when we run trains by the time interval system. To abolish the use of 10,000 watches *as safety appliances* would afford a relief which can be fully realized only by experiencing it. The subject before this meeting will very likely bring up some valuable discussion, but we do not look for any radical or comprehensive body of recommendations. The double committee in its report on signaling will probably attempt nothing more than to set forth facts as they are; that is, the state of the art as it appears from a survey of the practice on the roads in the Association. It goes without saying that this will disclose enough diversity to preclude the recommendation of rigid standards, except in a very few details of signaling, and that therefore a comparison of the merits of different appliances and methods would be a very profitable occupation for the meeting to engage in. We have said that we shall not look for any radical recommenda-

tions. In fact, the American Railway Association is not a body of reformers. In the nature of things it is and must be a very conservative body. The interests which it represents are too vast to be lightly disturbed. The most that it aims to do or should aim to do is to keep just far enough ahead of average practice to keep the procession moving. By following that policy it has succeeded admirably so far. It has advanced the art of railroading pretty steadily, and has established confidence in the soundness of its judgment as a body.

The Best Metal for Brake Shoes.

The Secretary of the Master Car Builders' Association has issued a circular of inquiry asking for information about the friction and wear of different metals for brake shoes. This subject is probably the next one of considerable importance to be considered by the Association. As it is to-day, the shoes used in this country vary as much as 50 per cent. in holding power, and yet the Association has been to much trouble to get a standard of braking leverage for cars. So different is the friction of the different materials for brake shoes that even on roads where there is a standard of brake leverage, the locomotive engineers notice a great difference in the way in which the brakes take hold on cars belonging to the same company, but furnished with brake shoes made at different points. On some roads shoes are made up from scrap castings just as the scrap happens to run. Recently in the West a wreck was caused by the brake shoes being too hard, and on the elevated roads a change in the brake shoe material is felt at once by the engineers. The hard shoes have much less friction than the soft ones; the hard shoes make more noise than the soft shoes. Shoes with wrought iron pieces let into the face have about the same friction as soft cast iron, and wear longer. Shoes with chilled sections in the face have but little friction and wear for a long time. Wrought iron shoes give much friction and cut and tear badly. Cast steel shoes are like cast iron in that the friction and durability vary with the hardness. Soft steel acts like wrought iron, and hard steel like chilled cast iron. Add to this information that which was obtained by the brake shoe committee in the 1891 tests, and one has about all that is known to-day about brake shoes.

It amounts to this: A hard shoe wears longer than a soft one, and a soft shoe has more friction than a hard one; the maximum durability with maximum friction is probably obtained with a wrought iron and cast iron composite shoe. This information is so little and so indefinite that it is highly unsatisfactory to such large roads as have foundries from which they can turn out either hard or soft shoes or any composite shoe that may be best.

Another fact which makes this brake shoe metal question an important one is that the exceedingly high speeds at which trains are now being run demands the utmost care in providing braking power, and this in turn necessitates more information than we now possess about the best kind of metal for brake shoes for the different classes of wheels and the different conditions. So far as the cost is concerned, it does not matter much, as it is so largely a question of safety; yet one might say that with a hard shoe the pressure could be increased to give the same friction as with a soft shoe; but if it were so increased, would not the rate of wear, and therefore the cost, be the same for the hard as for the soft?

There are two vital questions to be answered: What brake shoe material is best for high speed work with steel tires? What is the most practical material that can be adopted by the Master Car Builders' Association as the standard for brake shoe material throughout this country? Or the question might be put: What is the proper standard of friction in pounds between a brake shoe and a wheel that is so practicable to obtain that it may be adopted as a standard by the Association? The time is not far ahead when these questions will have to be answered. Probably most railroad men would say that, from the face of the evidence, a long, soft, cast iron shoe is the best for steel tires running at high speed, and that a medium grade of cast iron is the most practicable standard for brake shoe material; but there are so many conditions to consider, and so little is known about the comparative merits of shoes in general, that no committee will be justified in recommending a standard brake shoe material or a standard amount of friction between the shoe and the wheel without making an exhaustive experimental investigation.

In addition to all other matters about brake shoes, there remains yet to be considered the advisability of using shoes having a bearing on the flanges of the

wheels. It is generally understood that such shoes have a materially increased friction and that where they are used the braking leverage must be reduced. These are all serious questions, and we cite them only to show how important the subject is and how great is the work in front of the committee. Those who can should give the committee every assistance possible by sending in such data as they have of the kind that is called for by the circular letter of inquiry.

World's Fair Rates Still Unsettled.

The salient fact in the passenger rate situation between the Atlantic seaboard and Chicago is the universally unsettled state of affairs. No traffic manager seems to know how much business is to be expected, and therefore is at sea as regards the extent to which he ought to make reductions in rates or offer other inducements to prospective passengers to make their wishes known. The continuance of this feeling, week after week, strongly confirms what we have said, that the unanimity of view among all the lines proves that no one of them has made any great mistake in its action so far. It would seem as though this should have some effect on the attitude of the daily newspapers, but it apparently does not, for they have come out in the last ten days with reiterations of their former argument, that the railroads would be sure to increase net earnings by further reducing rates and thus enlarging the volume of traffic. The present state of affairs also emphasizes what we have said before, that those excursions in the past in which railroads have carried passengers at half-fare and have made some little money by doing it, have been for short, definite periods, and have been carried out at times when cars and engines could be assigned beforehand to that business with a reasonable certainty that they would not be in demand elsewhere. A consideration of this simple fact should show to anyone who cares to look at the question fairly that the long term of the World's Fair, and the consequent disturbance of ordinary business by any reduction made, is one of the vital elements in the difference between the present situation and other situations which are brought up in arguments for reduced rates; the Christian Endeavor and the Grand Army conventions of last year, for instance. It is also to be remarked in passing that the officers of the Pennsylvania Railroad are currently reported as holding that they lost money on the last-mentioned excursion.

The disturbance of regular local rates—which means disturbance of the whole passenger earnings—which is a serious question to every traffic manager, is illustrated by the complications already encountered in making the 20 per cent. reduction. All large excursions disturb regular rates more or less, and the only thing that makes them tolerable is the short and limited time during which their influence is felt. The trunk lines have had a very sharp controversy on the question of giving reduced rates for one-way tickets. The New York Central and the Pennsylvania insist on applying the reduction only to round-trip rates, feeling confident, no doubt, that they can enforce the non-transferable clause in their tickets and thus prevent the abuse of the reduced rates by scalpers; but the Erie, and other lines, believing that such reductions as are quite sure to be forced in any event may as well be made openly and systematically at the outset, demand a reduction in one-way rates. This argument is a strong one, as open warfare is always better than secret or half-secret hostilities, but the other side seems to have carried the day. The demand for low one-way rates is from people who wish to go west by one line and return by another, and from those in the West who wish to visit New York as cheaply as New York people visit Chicago. It is natural and reasonable that the roads should resist this last demand, but the other ought to be granted, as many passengers deem it a great advantage to see two different stripes of country in making a round trip. This favor could be granted on round-trip tickets by a simple agreement between the roads. But one-way tickets at reduced rates would draw east bound traffic from the far West through Chicago and away from St. Louis, which would make another cause of trouble.

The roads west of Chicago seem to be in somewhat the same quandary as the trunk lines. They have held conferences day after day, but they cannot agree on any large reduction. They can agree on a small one; but there seems to be no confidence that the weaker lines will keep such an agreement if they make it. The conditions in the West are so different from those in the East, that the final outcome is likely to be greater reductions, but more irregularity. The roads have less regular business to be interfered with, and so have less to lose and more to gain by radical reductions of fares; but the conservative roads oppose these reductions;

and secret cuts are the natural consequence. These are likely to keep both the roads and the public uneasy, but as long as there are so many roads for so little business there is apparently no help for it. The fact that this long-distance excursion business can be done with borrowed cars (sleeping cars) promotes instability of rates, and this element is probably more harmful in the West than in the East.

The "Ann Arbor" Case.

The decisions of Judges Ricks and Taft in the strike cases were delivered in the United States Court at Toledo, O., last Monday. Judge Ricks released seven of the Lake Shore enginemen who quit work rather than move the obnoxious Ann Arbor freight, holding that they had a perfect right to resign at the time they did; and imposed a fine of \$50 and costs on James Lennon, who twice refused to handle cars from the Ann Arbor road, but did not resign his place. Lennon was let off with a light punishment, because he disclaimed the intention of disobeying the law. His case has already been appealed. Judge Ricks discusses at great length the right of a Court of Equity to decide a case like this, but the essential question (whether quitting without notice is disobedience of the injunction) is treated very briefly, and the warning to the men that they could not always decide for themselves, regardless of the interests of the public when to quit work, which Judge Ricks delivered to the men when they were arrested, is ignored. The question of the greatest popular interest, therefore, receives no illumination from Judge Ricks at present. He gives warning, however, that if there is any further disobedience of his injunction the case "will be dealt with in a spirit and purpose quite different" from this. Of course every sensible man and law-abiding citizen must regard the substance of this decision as just. An engineman who tries to discriminate between different connecting roads is an enemy to the whole public. But the right to quit is an immeasurably broader question, and on this point the present case would perhaps fail on technicalities. As these technicalities will doubtless be strenuously argued when the appeal is heard we may not get much light on the vital question even then.

Judge Taft continues the injunction against Mr. Arthur, ordering him not only to refrain from actual discrimination between roads, but to refrain from endeavoring to persuade or induce employés to do so. The Judge evidently accepts the averment of the complainant that Arthur has a controlling influence over his members, and that his notice to divisions to "obey the laws of the brotherhood" in effect empowered the members, if it did not command them, to begin the boycott. Mr. Arthur testified that his assistant signed his (Arthur's) name to this notice without due authority, but the Judge, so far as we have seen, does not discuss this point. But all persons combining to carry out the boycott rule of the brotherhood are punishable under Section 5,440 of the Revised Statutes, which imposes imprisonment and a heavy fine for conspiring to commit any offense against the United States. Judge Taft continues:

The probable inconvenience or loss which its employés might impose on the complainant company (the Ann Arbor) by withholding their labor would, under ordinary circumstances, be a legitimate means available to them for inducing a compliance with their demands. But the employés of defendant companies (the Lake Shore) are not dissatisfied with the terms of their employment. So far as appears those terms were of mutual benefit to employer and employed. What the employés propose to do is to deprive the defendant companies of the benefits thus accruing from their labor unless the companies will consent to do a criminal and unlawful injury to the complainant. Neither law nor morals can give a man the right to labor or withhold his labor for such a purpose. Under the principle above stated Arthur and all members of the brotherhood engaged in causing loss to the complainant are liable for any actual loss inflicted in pursuance of their conspiracy.

Judge Taft defends his order directing Arthur to rescind a boycott notice which had already been issued, saying that there was absolutely no other way of maintaining the status quo. Judge Taft's decision, like the other, will have general approval, for this boycott rule of the engineers not only runs against the common law, as all boycotts do, but conflicts with a plain and just provision of the Interstate Commerce law (Sections 3 and 10). But at the same time the decision affects no one but Mr. Arthur, and the power of the rank and file of the brotherhood to indulge in illegal discrimination without any formal rule and without any visible action of any leader remains about as strong as ever. There has been considerable boasting about this power, and the possibility of its being used, but we shall not be surprised if this decision has a very wholesome effect, for there is a large body of men in the enginemen's brotherhood who will see and acknowledge the justice of the principle involved in it.

Car Coupler Tests and Records.

In another place we print copious extracts from a paper on car couplers by Mr. Waitt. His analysis of such records as he has been able to gather is very interesting, and some of it accords with the analyses that have been made before by other writers on this subject, and is, particularly in the guard arm and pin hole conclusions, in line with what has been pointed out by the *Railroad Gazette* before. The general results given by Mr. Waitt show that, while it is true that changes have been made in design and in material from cast to malleable iron and to cast steel to increase the strength of the vertical plane coupler, yet there is but little evidence of resulting gain in strength. This arises, as we see it, more from the continual dropping of the price of couplers, leading to the use of a poor quality of material, than from lack of improvement in the design *per se*. There is no doubt that the moving of the pin hole backward in the knuckle, the covering up of the fulcrum lugs by a projection on the heel of the knuckle, the strengthening of the tongue of the knuckle and the increased dimensions of the guard arm ribs have had the effect of improving the design of couplers generally; and if the exact records were at hand it would be found that these changes, which are theoretically correct, have reduced the comparative number of breakages. This is, perhaps shown from Mr. Waitt's statement about the reduction in pin hole breakages resulting from an improvement in the design of the knuckle of a particular type, which, as we understand it, consisted in moving the pin hole inward about $\frac{1}{8}$ of an inch.

Constructing engineers have perhaps a false idea of malleable iron; so also have mechanics. Their ideas are based upon such malleable iron as is put into small hand tools, link belts and wood trimmings such as hinges, hooks, etc.; and so long as their experience is confined to such small parts, their ideas of malleable iron serve them well; but in such large bodies as car couplers malleable iron is quite a different material, and it has as many varieties as cast iron, which varies from brittle stove plate to a tough wheel iron. There is no doubt that the better classes of wheel iron will make stronger car couplers than some grades of malleable iron now generally used. Steel has as many varieties as cast iron and malleable iron. The poorest of it is no stronger and of no more value for car couplers than the poorest cast iron. The best of it is the strongest and toughest form in which the metal iron can be cast. The best steel, like the best malleable iron, costs more per pound than some car couplers are now being sold to middlemen for; hence it is evident that no car coupler manufacturer can put the best quality of either cast steel or malleable iron into car couplers and sell them at the prices for which some car couplers are now offered on the market. Any railroad man having at heart the good of his company cannot consistently purchase couplers in the open market, with all the vast array of designs and the wide difference between good and bad material in front of him, without stopping to determine which is the most practical coupler to purchase. Probably after a very careful analysis of all the conditions and the wrecks and results of breakages, a broad minded purchaser will be compelled to decide that, with couplers, as with axles, the best is the cheapest in the end. Fortunately, one has not much trouble in selecting a proper design of coupler; there are many such. So also in selecting the best manufacturer. The purchaser has but little else to do than to select the proper material; and we take occasion here to say again that the proper material is not necessarily cast steel nor malleable iron, but either, according to the physical characteristics. A coupler made of the best malleable iron possible to manufacture cannot now be purchased in the market at ruling prices; but such a coupler is better than the average cast steel coupler now offered for sale. On the other hand, of course, it is not to be expected that the best malleable iron is as good as the best cast steel. It is not possible that such could be the case. The railroad company that buys the best steel couplers will have to pay high prices, and probably more per car than would have to be paid for the best malleable iron that it is possible to make.

Mr. Waitt's conclusion that the best coupler to purchase is one "where greatest care is used in testing and inspection of material prior to shipment" is correct so far as it goes, but it would appear that this contemplates tests and inspection by the manufacturer, which is not a sufficient guide for a careful purchaser of railroad material. The purchasing agent wants to know from his own men whether the articles purchased are satisfactory or not, and the only way to do this is by the adoption of a standard of tests made by the railroad companies themselves just as tests are now made of axles, wheels, boiler material, oil, and all other important purchases. Mr. Waitt does not do justice to the proposed Master Car Builders' tests when he concludes that such tests of vertical plane couplers do not show the character of material or the endurance of a coupler. We have been present at a great number of tests of vertical plane couplers, and such couplers as have stood the proposed tests have been made of such excellent material as to be so superior to the couplers ordinarily sold as to leave no question about their durability in service.

Contrary to what Mr. Waitt has said, the Master Car Builders' test does incidentally include a guard arm test. It happens in this way: When the 1,640-pound drop falls on the knuckle it bends inward at each succeeding blow until finally at the last blow at 10 feet, and at the two blows at 15 feet, the weight glances to the guard arm, and in a majority of the drop tests of couplers that we have seen those couplers that fail under the M. C. B. test have the guard arms broken off by the drop. It is possible to so place a coupler under a drop as not to get a blow on the guard arm; but then it is not placed according to the intent and meaning of the proposed tests. Mr. Waitt has said that the proposed tests do not include a test of the shank; but this is not a fact, as the coupler rests on the end of the shank, and such couplers as stand the tests have the shanks very badly distorted during the tests. One blow at 10 ft. usually breaks a weak shank, and the coupler has not yet been made that will stand all of the drop tests without a considerable bulging and bending of the shank. By the proposed tests the material in the shank, in the pivot lugs and in the guard arm gets severe treatment, and while it is true that the tests are so arranged that it is possible for one coupler to have less severe punishment than another, yet the tests themselves are so severe that any coupler, however favored within the limits of the specification for apparatus, that stands the tests may be considered a safe coupler to use. In this way the tests are safe for a railroad to follow. If there is any just criticism of the tests it is that they are too severe, and the meta is too severely treated, rather than that they are not severe enough and do not give a complete indication of the material used. Of course, a special guard arm test is desirable, but it is a difficult one to make and if made should be added to the proposed tests. In fact, one might say that, so far as the coupler head itself is concerned, a guard arm test is all that is necessary; for if a coupler is made of such a material that the guard arm will stand the blows specified for the coupler as a whole, one may be assured that the material is satisfactory in all respects and nothing further need be done except to test the knuckle and make a careful examination of the arrangement for locking and the size of the pivot pins and lugs. The proper size for pivot lugs and pins is now pretty well understood; in fact, they cannot be made stronger for pulling than they now are within the limits of the Master Car Builders' lines, except by bettering the material. If the proposed tests are wrong and non-conclusive, a good way to prove it would be to bring forward a coupler that would meet the tests and yet have serious defects in material and design which would lead to breakages from buffing blows in service. We should like to see such a coupler, and doubt if one could be made.

It is an important fact that all guard arms that we have seen broken in tests were broken because the material was too fragile to stand the blow. An examination of the conditions will show that there is a more severe strain on the material in a guard arm under a drop than on the material in any other part. It is a breaking strain, and not a crushing strain, and this is largely the reason for the breakages; and only the best and most ductile materials can be made to stand a guard-arm test that approaches in severity anywhere near the severity of the proposed tests for couplers as a whole.

Mr. Waitt also says that a pulling drop test is necessary; that is, a test that will give a shock and pull on the coupler at the same time and in the same direction. The real necessity for this does not appear from an observation of such tests as we have seen, the reason being that when a steady pull in a machine shows the knuckle to be strong enough to withstand the limits imposed by the proposed tests, and the drop test does not reveal any weakness in the knuckle, there is quite sufficient evidence that the material of the knuckle and the arrangement of the lock are of a kind that will withstand any pulling shocks that will be produced in service. The knuckles cited by Mr. Waitt as having broken frequently in service belong to the class that have never yet been made to stand either a pulling test or a drop test as severe as that called for by the proposed tests.

Mr. Waitt also would change the proposed tests and

mount the couplers on about the same fastenings as are used in regular service. If by this is meant supporting the coupler on a block of wood placed under the buffer stop, the change is a desirable one; but if it is proposed to put draft rigging and springs under the couplers in a drop test, it is not clear how the material in the coupler can be examined critically, for the reason that the elasticity and weakness of any draft gear now used absolutely prevents a blow being given to the coupler that would in any way test the material as it should be tested. This was clearly shown at the Saratoga convention last year when two blows at 10 ft. smashed one of the strongest draft riggings in the market. A third blow at 10 ft. would have shattered all the timber and ironwork into fragments, and this would be done without in any way injuring the coupler. Couplers are not broken in service by blows received and resisted by the draft gear, but only by the blows that drive the buffer stop against the end sill, and in this way meet a resistance which permits a sufficient impact to cause a breakage. A test with the coupler supported on a buffer stop might lead to a better knowledge of the strength of a coupler to resist blows than a test with the coupler supported on the shank; but, on the other hand, when a coupler is made of a material that will stand the proposed test when supported on the end of the shank, it is logical to conclude that it will stand the same test when supported in any other way. This appears from the character of the strains resulting when the support is on the end of the shank.

One word about the advisability of coupler tests by railroad companies. Couplers belong to that class of railroad equipment devices which may be termed "important;" that is, they are devices the failure of which may result in large consequential damages. To this class belong wheels, axles, boiler shells, air brakes, and rails; and no responsible purchasing agent in these days buys material belonging to this class without such careful inspections and tests as are necessary to determine within close limits the nature of the material and the strength of the parts.

It is not quite clear what Mr. Waitt means in his recommendations; but it would appear that his point is that the true and only test at the present time is to equip 100 or more cars and put them in regular service and keep a careful record of all breakages and renewals. We would not wish to believe that this is the sort of test that Mr. Waitt would propose for important details of railroad equipment; that is, such as wheels and axles. It would be a very dangerous plan to follow. No doubt such a practical test as a service test is necessary as an adjunct to a physical test to determine beyond any doubt all of the results of service; but to take up the service test without a preceding physical test is a dangerous thing to do.

Mr. Waitt has said that the pulling test does not in any way show whether the coupler and knuckle are weak or defective in the parts which are the most expensive sources of failure. This is true of the guard arm, but in most pulling tests the tongues break; and does not this indicate weakness in the knuckle? The pin hole breakages may be as much due to the jamming of the link as to the pulling shocks in service, and it is not probable that a drop pulling test will develop a material weakness in the pin hole part of the knuckle unless a small or weak coupling pin is used in such a test. In shop tests it has been customary to use a large, hard and stiff steel pin for the connection between the machine and the knuckle. No doubt if an ordinary pin were used more weakness would be shown in the pin holes than has been shown by pulling tests up to this time. Increased strength around the pin hole in the knuckle can only be obtained by moving the pin inward and by using better material; the design is fixed by the M. C. B. standard, hence it is not clear how a drop pulling test will show anything more about the pin hole breakage than is evident when one knows the kind of the material and the thickness of the knuckle in front of the pin hole. There are so few couplers that meet the proposed tests under a specified condition that we confess some curiosity about which are the couplers that "have shown A 1 results by the drop and pulling tests and are failures in actual service."

The statement that with rigid steel knuckles the coupler has to stand a severity of shocks not obtained with malleable iron or wrought iron knuckles is a good argument for steel knuckles and undoubtedly a true one, as malleable iron has been proved to be practically worthless in knuckles and wrought iron bends badly at the first blow of 10 feet.

One case is cited where the loss incident to the breakages through the tongues of the knuckles was so great in actual service as to lead a railroad company to "keep clear of the adoption of such a poor device." We should

question very much whether it was necessary for the railroad company to put in such couplers in service to gain these conclusions, and could not this weakness, made evident by service, have been determined by a preliminary mechanical test?

It is curious that the best and poorest knuckle records were from good cast steel, therefore "indicating that the matter of freedom from knuckle breakage is not of one kind of material so much as design, construction and care in inspection." This conclusion may be true of any particular bad knuckle design, but not of knuckles in general. It is evident that a good or bad material will determine a good or bad knuckle if it is made on a proper design, therefore, when the design is good, and with our present knowledge of couplers there is no excuse for a bad design, the character of the material governs the strength of the knuckle.

It is said that the best and poorest results from coupler heads were obtained "from couplers made of the same grade and the same kind of metal (malleable iron)." "Cougliers made of steel show an equally large proportion of broken guard arms." It is not stated what method was used to determine what the malleable iron in both cases was, or how it was determined that the cast steel couplers were of a good material, and without this information one cannot judge of the correctness of this conclusion, as the varieties of malleable iron and cast steel are so great that a cursory external observation is but little indication of a good or bad material.

One of the most useful of Mr. Waitt's conclusions is, "the best results are obtainable largely from careful designing and a rigid inspection and tests of material." Of course this conclusion somewhat conflicts with the recommendation to try 100 or more cars in actual service, but it is also recommended in the final conclusions that couplers be selected "where greatest care is used in testing and inspection of material prior to shipment," but we understand this to mean testing by the manufacturer.

The useful lessons to be drawn from Mr. Waitt's observations are, on the whole, about as follows:

- (a) Tests of couplers, both for material, design and workmanship, are necessary.
- (b) The guard arm is the weakest part of the vertical plane coupler as now generally made.
- (c) There is too much variation in the strength of the designs *per se* of couplers, as now constructed; the one main defect being in the knuckle tongues and pin holes.
- (d) Increased strength at the joining of the coupler shank and coupler head is very desirable and may be had without interfering with repairs and interchangeability.

The petroleum trade with India and some other Eastern countries has grown to great dimensions. The annual consumption amounts now, it is supposed, to 35,000,000 cases, valued at about \$35,000,000 and it is increasing steadily. Most of this goes from the United States by sailing vessels around the Cape; and a small but still important part goes from the wells of Baku by rail to Batoum and by steamer through the Suez Canal. This is all shipped in cases, and naturally there are various powerful interests concerned in keeping this great trade flowing in the same channels. It is a valuable trade to the American producers, to the makers of tin plate and to the shipowners who carry it; but with the great supply produced close to the gateway of India, it was not in the nature of things that it should go on undisputed. So a syndicate was formed to build tanks at the chief Eastern ports and to carry petroleum in tank steamers from Batoum through the Black Sea and the Suez Canal. Naturally this would be a grave menace to the Eastern case-oil trade in all its branches, and great efforts were made to prevent the shipment of petroleum in bulk through the Suez Canal. The dangers to other trade through that great waterway from the tank steamers were presented strongly and assiduously wherever it might be profitable to create opinion. Protests were made to the Suez Canal company, and the British Government was asked to interfere. All other expedients failing, suit was brought before the Mixed Tribunals at Alexandria, to compel the Canal company to withdraw the permission given to the syndicate to send "tankers" through the canal. The plaintiffs were non-suited and had to pay costs, and the right of the company to make its own regulations for the canal traffic seems to be established. Indeed, it is questionable, at least, if the company has the right to close the canal to any particular class of vessels. The results of this decision of the Mixed Tribunals will be very important, if it is not overthrown. We should suppose that it would soon be the end of the case-oil trade to the East, but the consumer ought to profit, and probably will, by a cheaper supply, and perhaps oil will before long be distributed through India in bulk in tank cars.

It is reported from Colorado that the bill abolishing the office of Railroad Commissioner has been passed over the Governor's veto. This bill seems to have provided no official body in place of the Commissioner,

and to have abolished all laws providing specifically for supervision of railroads. The bill which had been passed by the Minnesota House of Representatives making the business of ticket brokers illegal was stolen last week. It will be remembered that a similar fate overtook a bill of this kind in another Western state. The Minnesota people were not to be thwarted, however, and a new bill was prepared and passed. The Senate Committee has approved of a number of railroad bills, which will probably be passed within a few days. One of these is that of Mr. Fleming defining the qualifications of locomotive engineers. The Nebraska Legislature has passed the Maximum Freight rate bill after a deadlock of three days. It decreases present railroad rates in Nebraska about 20 per cent. In Texas there has been a favorable report on a bill requiring railroads to maintain separate waiting rooms for negroes at stations where 100 citizens ask to have the races thus separated. A law has also been introduced in the Texas Senate which is intended to compel railroads to keep their accounts so that the commissioners can have reports of Texas business separated from Interstate business. The Wisconsin law intended to increase the liability of employers for personal injuries to employees provides:

"That every railroad shall be liable for all damages sustained within this state by any employee of such company without contributory negligence on his part: First, when such injury is caused by any defect in any locomotive engine, car, machinery or track which defect could have been discovered by reasonable diligence; second, while any employee is engaged in operating, running, riding upon or switching any train or engine and which injury shall have been caused by the carelessness or neglect of any other employee, officer or agent of such company."

The 24-hour train from New York to Chicago over the New York Central and the Lake Shore is to be duplicated when the Spring time-table is put into effect; a second train, substantially similar to that now leaving New York at 10 o'clock in the morning, will start at noon. In addition to this the presidents of the Vanderbilt lines, at a meeting last week, agreed that they would put on a train to leave New York in the afternoon, probably at 2 o'clock, to run through to Chicago in 19 hours (or 18 hours, apparent time) over the Lake Shore, and a statement to this effect was given out to the reporters; but the operating officials of the Central will not say that they have yet fully decided to put such a train on. The establishment of a train like this, to run 905 miles at a schedule equal to that of the Empire State Express, will be an event in the railroad world, and much interest has already been aroused. No details are given out except that the train will consist of three sleeping cars, a dining car and one other car. This will make the train heavier than the Empire State Express. As the train runs all night it will not be necessary to run the dining car through, but even without that, the train will be heavier than the Empire State, because three of the four cars in the latter, although they have six-wheel trucks, are ordinary day cars. The Empire State has consisted of five cars between New York and Utica during the summer months. It does not appear that anything has been done about a fast east-bound train from Chicago. We print on another page two illustrations of the engines which haul the Empire State Express, together with some data about the speeds required for these fast runs.

Senator Higgins, of Delaware, has introduced resolutions in the Senate, at Washington, intended to reopen the question of repealing Section 5 of the Interstate Commerce act. The passage by the last Congress of the law intended to increase the power of the Interstate Commerce Commission to compel the attendance of witnesses and the production of evidence, is expected to change the views of that body on the pooling law, and the Senator therefore thinks that the question may well be taken up again. Senator Higgins has also introduced a resolution to stir up the pending questions about consular seals on freight cars coming from Canada.

NEW PUBLICATIONS.

Engineers' Pocketbook. Prepared by the Technical Society, "Hütte," of the Royal Technical School at Berlin, Germany. Fifteenth edition, revised and enlarged. Size, $4\frac{1}{2} \times 7\frac{1}{2}$ in.; 1,344 pages, with 1,089 illustrations and one plate. Berlin: Wilhelm Ernst & Son, 1892. Price, 9 marks.

With characteristic German thoroughness, the contents of this pocketbook, so called, have been extended considerably beyond the limits which it would no doubt have been thought well to maintain in an American publication of the same class. In fact, the name given to the volume is somewhat of a misnomer. The American idea of a pocketbook is hardly carried out in this voluminous work of over 1,500 pages.

The work, which, as above indicated, is now in its fifteenth edition, has been carefully revised and much enlarged. It is made up of two main parts of 816 and 728 pages respectively, and these, in turn, are subdivided into 10 chapters, the headings of which afford the best outline of the contents. There is, to begin with, a chapter containing tables of logarithms, squares and cubes of numbers with roots, divisions on trigonometry and analytical geometry, differential and integral calculus,

mensuration, etc. Then follow chapters on mechanics, heat, resistance of materials, mechanics of machinery, machine tools, hydraulic machinery, hoisting, pumping, blowing and air compressing machinery, water-works and water supply, water motors, steam engines and boilers. All these are comprised in Part I. Part II. begins with chapter on surveying, describing the various instruments and their application, and then presents successively the subjects of railroad construction, equipment and operation, bridges and roofs, foundations, marine architecture and marine engines and boilers, the metallurgy of iron and steel, textile mills and machinery, gas manufacture and distribution and electricity. A general treatment of the various materials of engineering, including the commonly used metals and alloys, as well as the non-metallic materials, is given in the last chapter, after which comes an appendix of miscellaneous useful information, such as tables of the currency of different countries, tables of weights and measures, extracts from the German patent laws, etc. An elaborate and apparently carefully prepared index takes up the last 16 pages.

A detailed consideration of the work can obviously not be well made here, nor is it necessary. The simple statement that a pocketbook character, as it may be termed, has, in the main, been preserved in the treatment of the various subjects, will be sufficiently explanatory, and to this may be added that this treatment is more than ordinarily complete. There are numerous foot notes referring to various works which may be consulted for more detailed information on certain subjects. As to the accuracy and corresponding value of the matter presented in the volume it is only necessary to say that the board of editors and contributors comprise some of the most eminent German scientists and engineers. The book is in paper cover, sufficient margin, however, being left to allow for more substantial binding.

Advanced Primers of Electricity. By Edwin J. Houston. New York: The W. J. Johnston Company, Limited. Price \$1.

"Electrical Measurements and Other Advanced Primers of Electricity" is the second volume of Professor Houston's series of elementary electrical treatises for students and non-technical readers, recently issued. The first volume, issued several months ago, is entitled "Electricity and Magnetism," and the publisher promises to issue a third volume, which will complete the series. Professor Houston was the author of the electrical primers which were so popular at the electrical exhibition in Philadelphia, nine years ago, and these books are in the same line, although the matter is so greatly amplified that they are hardly to be compared with the earlier works. The book now issued (the second) derives its title from the first three "Primers" in it, which are on the measurements of electric currents, electromotive forces and resistances, respectively. The object of these primers is not so much to teach the practical operations of electrical measurements as to explain in simple but exact terms the principles and apparatus upon which they are based. Two primers are on voltaic and thermoelectric cells and other sources of electricity. The principles upon which commercial currents are based are explained in three primers, and nine others are devoted to the principles and applications of dynamos, motors and transformers, the eighteenth and last primer being a review, or "Primers of Primers." The first volume, like the second, contained 18 primers relating to the various sources, and phenomena of static and current electricity and of magnetism. Atmospheric electricity and the phenomena of the earth's magnetism are explained. Professor Houston supplements nearly every primer with brief extracts from standard works, which serve to give the lay reader an introduction to electrical literature.

Dynamo Machinery. By Prof. John Hopkinson. Published by The W. J. Johnston Company, Limited, New York.

This is a little volume of 250 pages containing a dozen papers on dynamo machinery and allied subjects which have been printed in the proceedings of various English technical societies and magazines, but which are here gathered in one place to make them conveniently accessible to American readers.

A Manual of Machine Design and Drawing. By David Allen Low, Head Master of the People's Palace Technical School, London, and Alfred William Bevis, Director of Manual Training to the Birmingham School Board. London and New York: Longmans, Green & Co., 1893. Price, \$2.50.

The authors have aimed to provide in this book a large number of dimensioned illustrations which may serve as good examples for students, ranging from the simplest machine detail to a set of triple-expansion marine engines. In the development of the subject they have attempted also to describe such a variety of machine details as will help the designer, and have given rules and tables of proportions. There are numerous illustrations which have been especially prepared for the work, and the authors have endeavored to select examples representing the best modern practice. The introductory chapters treat of the materials and tools of the draughtsmen and briefly of the principles of projection, shading and construction of drawings; they give also some elementary principles of mechanics and of the strength and nature of materials used in machine construction. This part of the book occupies but 45 Conn.

pages; the other 330 pages are given up to drawings and illustrations of a great variety of machine parts and of gearing. Altogether the book strikes us as being a complete and admirable manual. Its usefulness is increased by an index of seven pages.

Journal of the Association of Engineering Societies. February, 1893.—The February issue of the *Journal* contains some interesting articles. One of these is on "Continuous Rails," by Mr. Augustine W. Wright, of Chicago. Mr. Wright claims to have suggested to Mr. Moxham the tests on the expansion of rails which Mr. Moxham made a few months ago, and which formed the subject of a paper presented by him before the Street Railway Convention, in Chicago, and widely reprinted. Mr. Moxham's paper is reproduced in the *Journal* with all its tables. Another interesting article is Prof. J. B. Johnson's address as retiring President of the Engineers' Club of St. Louis, entitled, "The Birth of a Profession," which is a very scholarly account of the development of the engineering profession in this country. Another article is on "Cross Ties for Railway Bridges" with discussion, which we print in another place, and still others of interest are on the "Engineering Congress at the World's Fair," by Mr. O. Chanute, and on "Character in the Engineering Profession," by Mr. Isham Randolph. This is his address as retiring President of the Western Society of Engineers.

Transactions of the American Institute of Electrical Engineers. Volume IX., 1892. New York: Ralph W. Pope, Secretary, 12 West Thirty-first street. This is a collection of the papers and discussions at each of the 12 monthly meetings of the Institute during 1892. Naturally there is much that is very valuable in the volume, and we may mention as of especial interest to our readers the inaugural address of President Sprague on the Coming Development of Electrical Railways, and Electric Railway Motor Tests, by Messrs. Shepardson and Burch, with discussion by many members, continued through two meetings. The volume contains also a list of the members of the Institute.

TRADE CATALOGUES.

Globe Castings and Fittings for Water-Works, Mills and Railroads. Builders Iron Foundry, Providence, R. I.

The 1893 catalogue of Globe Special Castings is, like those castings, "unusually compact, strong and light." More than 250 varieties are listed, and all the more common sizes are kept in stock. The general form of the "Globe special" is that of a sphere with bells attached, and it is made as light as the necessary strains permit, and the arrangement of bells is a matter of convenience and economy. Reducers are shown and quoted, and for these a uniform taper reducing the diameter 3 in. for each foot run has been adopted. Various other fittings are listed, and the names are given of the water-works, mills and railroads using the product of this concern.

TECHNICAL.

Manufacturing and Business.

Rieble Bros.' Testing Machine Co., Philadelphia, report the following among other recent orders: American Telephone & Telegraph Co., New York, one 30,000-lb. vertical screw power testing machine; Metropolitan West Side Elevated R. R. Co., Chicago, one 1,000-lb. U. S. standard cement testing machine, with worm gear, rubber pointed grips, and sundry special appliances; Leland Stanford, Jr., University, Palo Alto, Cal., one 20,000-lb. vertical screw power testing machine, with indicator; Chicago, St. Paul, Minneapolis & Omaha Ry., St. Paul, Minn., one 150,000-lb. screw power testing machine, with vernier poise beam and tools for tensile compression and transverse strains; Madison Car Co., Madison, Ill., one 5,000-lb. transverse testing machine with indicator; Ewart Mfg. Co., Indianapolis, one 20,000-lb. horizontal screw power testing machine; Gillett Hertzog Mfg. Co., Minneapolis, Minn., one 5,000-lb. transverse testing machine with indicator, for testing specimens 48-in. long; and other smaller orders.

The Western Construction Company, with capital stock of \$600,000, was incorporated in Iowa last week by W. W. Carr, F. A. Bill, of Dubuque; E. M. Dickey, of Chicago, and James A. Davis, the latter being Manager. The company has the contract to construct the Santa Fe, Prescott & Phoenix road, and its principal activity will be in Arizona. It proposes a system of irrigating canals and various other enterprises in that state.

The Grigsby Construction Co. of Dallas, Tex., has been incorporated to construct railroads and bridges. The directors are: G. M. N. Grigsby, A. D. Clark, C. D. Woodworth and D. E. Boice, all of Dallas, Tex.

The St. Louis Car Coupler Co. is equipping at the present time 2,500 cars at the Terre Haute Car Works, Terre Haute, Ind.; 8,000 cars at Indianapolis Car & Foundry Co., Indianapolis, Ind.; 1,200 cars at Mt. Vernon Car Works, Mt. Vernon, Ill.; 800 cars at Madison Car Works, Madison, Ill., and 200 cars at Litchfield Car Works, Litchfield, Ill.

New Stations and Shops.

The Berlin Iron Bridge Co., of East Berlin, Conn., has received the contract for the new rolling mill building from the New Haven Rolling Mill Co., at New Haven, Conn.

McLeod Railway Equipment Co.

A complaint is made by one of the railroad officers whose names are used by the above company in a circular inviting stock subscriptions that such use of his name in that connection is unauthorized, and as used is quite misleading.

A New Ferryboat.

The steel ferryboat "Netherland," built for the Hoboken Ferry Company, was successfully launched April 5 at the yard of T. S. Marvel & Co., at Newburg, N. Y. The length of the boat over all is 204 ft., breadth 42 ft.

Telegraph Facilities at Chicago.

In anticipation of a greatly increased business at Chicago during the World's Fair, the Western Union will make a 35 per cent. net increase in its facilities in that city after May 1. At present there are 185 offices in Chicago proper, and this number will be increased to 250 scattered about the city. Besides these there will be a large and very handsomely equipped modern telegraph office in full operation in the southeast wing of the Administration Building. It is to be finished in oak, and for dimensions and fittings will compare favorably with any exhibits made. There will be desks for 72 operators, and four counters at which business may be simultaneously filed. This will be the main office at Jackson Park, and in different parts of the grounds will be 18 branch offices. Of these two will be in the Manufactures Building, one in the Electrical Building, one in Machinery Hall, one in the Casino, one in the Agricultural Building, one in the terminal station and one at the Ferris Wheel on Midway plaisance, with others at suitable points. These branches will be connected with the office in the Administration Building and also with the main operating room in the city, at the corner of Jackson and Clark streets. Each office will be supplied with the latest and best instruments. The main office at Jackson Park will connect directly with the cable offices in New York, and with the Western Union offices in New York, Washington and the other large cities in the United States. The World's Fair plant will be operated by a complete system of dynamo currents and supplied with all the best modern electrical appliances.

The Illinois and Michigan Canal.

The Illinois and Michigan Canal Commissioners sent a communication to the trustees of the sanitary district of Chicago, at their meeting March 29, giving permission to use the canal from Ashland avenue to Summit. In doing so, they require the Drainage Board to submit for their approval the plans and specifications for the proposed improvements, so far as they relate to the canal, and that the Canal Commissioners shall retain possession of it. The details of the opinion were disputed by members of the board. It was held that the Canal Commissioners had no right to compel the Drainage Board to submit their plans to them and that the legal control of the canal did not properly belong to the Canal Commissioners, but to the Drainage Board. The President of the Board, however, was instructed to present to the Canal Commissioners the plans up to date, but only as a matter of courtesy. Chief Engineer Williams reported that the cost of work now under contract in sections 1 to 14 and A to F, inclusive, would be \$13,521,908. This amount, he said, could only be considered as a revised estimate; it is much less than any previous estimate given. He also submitted a report on the lands overflowed in the floods of May and June of last year, together with a map of the river valley showing the high-water mark of those times in all places, and a report on bench marks.

American Rolling Stock in Argentina.

According to the *River Plate Railway News* the Department of Engineers for the Province of Buenos Ayres, Argentine Republic, has issued a report in which the superiority of American rolling stock over that of British manufacture is affirmed in no ambiguous terms. The objection to British rolling stock is its extreme rigidity and excessive weight, which has proved unsuited to Argentine tracks. The North American rolling stock is recommended on account of its greater simplicity, lighter weight and better system of suspension; in addition to this the first cost and maintenance are much lower than in the case of European stock. The report further states that the passenger cars of American make are preferable to those from England, both as to first cost and maintenance, besides having a dead weight per passenger of only half that of the English built cars, while they give greater satisfaction because of their superior comfort and convenience. It is recommended that in future railroad companies shall be prohibited from introducing locomotives into the country without having previously submitted designs subject to approval or rejection by the Department of Public Works. This would give Americans an advantage, although it should be remembered that British firms offer locomotives and other rolling stock built after American models.

Metal for Brakeshoes.

The committee of the Master Car Builders' Association which was instructed "to investigate the relative friction and wear of different metals and different shoes in general use on chilled treads and on steel tires" did not meet or make any investigations, as the chairman who was appointed did not accept. The President of the Association has therefore instructed the Secretary to invite information from the members and to compile

a report. The purpose of this inquiry is not to consider any question of standard practice, but rather as an exchange of information.

In order to show the importance of the question in terms of the annual consumption of brakeshoes, either in pounds or in shoes, a blank form is sent to members with the request that they will have the total amounts of brakeshoe material procured on their respective lines or systems for the calendar year 1892 computed from their records, and the final figures entered in the proper places on the sheet. All members of the Association are also requested to send to the Secretary before April 30, such information, based on records of tests or of service, in their possession as will help to show the relative merits of different metals used for brakeshoes, or of different forms of brakeshoes, on chilled treads or on steel tires, for car or tender wheels, or similar information for driving wheels. If the information refers only to the relative wear of the shoes it will be of value, but it will be still more useful if it also shows the relative friction of different shoes on similar treads, or of the same shoes on chilled wheels and on steel tires with the same pressures. The importance of effective braking and of avoiding sliding the wheels, both for safety and for economy, will, it is hoped, appeal to all to add whatever they can in the way of answers to this inquiry.

United States Timber Tests.

In the last Congress the special appropriation for timber tests was pigeon-holed, in the House. The Senate, however, increased the appropriations for the Forestry Division by \$8,000, that is 20 per cent. of the amount asked and considered by those in charge as necessary to continue the work on a proper business basis. The testing will be discontinued until after July, when the new appropriations become available and then proceed at the slow pace which Congress has set. Those interested in the investigation will doubtless move again when the new Congress assembles. The first compilation of test results is now in the hands of the printer, and will probably be issued within six or eight weeks as "Bulletin 8, Timber Physics, Part II." It will contain the results obtained on longleaf pine, and will especially discuss in detail the results of tests and examinations of bled and unbled timber. The Forestry Division will exhibit the methods pursued in this work at the World's Fair, which will be of interest, since nowhere in the world has such comprehensive and systematic investigation of timbers ever been devised. The working plans for a similar undertaking by the Prussian Government have only just been perfected. Another exhibit of interest to railroad engineers and those interested in reducing forest waste will be a collection of the most approved types of metal railroad ties.

The Graduates of the "R. P. I."

A novel and interesting pamphlet of 27 pages is entitled "A Partial Record of the Work of Graduates of the Rensselaer Polytechnic Institute." It is the purpose of the compiler to point out the success of graduates of the school in a few of those pursuits which naturally absorb the greater number. The pursuits selected are grouped in five principal classes. The period covered by the record begins with the founding of the Institute, in 1824, and ends with the year 1890. During this period there have been 33 presidents of corporations, 121 vice-presidents, managers and superintendents, 69 chief engineers, 63 engineers of bridges, and 56 professors and assistant professors of various subjects in 35 different educational institutions in this and other countries. Eighty-eight per cent. of all these are living. There have been five state geologists, one of whom is living. Eleven per cent. of the members of the American Society of Civil Engineers in all grades, have been alumni of the Rensselaer Polytechnic Institute, or nearly four times as many as from any other one school. A list of 140 railroads in North America is given which these graduates have helped to build and operate; and they have held responsible positions as presidents and engineers in 19 of the largest and best-known bridge companies in the country. An interesting feature of the pamphlet is a diagram showing graphically the total graduates in each class, and the numbers in the above pursuits. Bridge engineers are not included in this diagram, probably because many of the names in this group appear in the other groups as well. Taking the percentages by decades we find that from the founding of the institute in 1824, to 1840 (inclusive) 14½ per cent. of all the graduates belonged to some one of the groups referred to; from 1840 to 1850, 22½ per cent.; from 1850 to 1860, 47½ per cent.; from 1860 to 1870, 44 per cent.; from 1870 to 1880, 35½ per cent.; and from 1880 to 1890, 15 per cent. The apparent falling off in the last two decades is accounted for partly by the omission of bridge engineers from the diagram, and partly by the fact that some time is required before the average graduate becomes notable enough to be classed under one of the groups. Finally there is a diagram showing by classes graphically the number of graduates who are members of the American Society of Civil Engineers. The total number of these members to date, 1892, is 190, in all the grades.

THE SCRAP HEAP.

Notes.

A Winnipeg paper states that the Northern Pacific and the Great Northern will continue to furnish meals in dining cars at 75 cents.

On the morning of April 3 a fire at the car house of the Orange Electric Street Railroad in Newark, N. J., destroyed the house and 26 motor cars. The total loss was about \$100,000.

Misses Jennie Smith and Adelaide Sherman are visiting railroad terminal points in Utah, Oregon and other states; in the far West, organizing temperance societies among railroad men. They say that they are aided materially by railroad officers wherever they go.

The Superior Court of North Carolina has rendered a decision sustaining the action of the state railroad commissioners in prescribing rates on telegrams in that state. The commissioners had made a rule that a 10-word message should never be charged at more than 25 cents, and it appears that the Western Union Company appealed to the court on the ground that a certain message was sent over a wire which ran via Richmond, Va., and that the message was repeated at Richmond.

In Paris, Tex., on the night of March 27, a man hunting for car robbers in the freight yard of the St. Louis & San Francisco shot and killed a negro as he jumped out of a car. Nine other negroes were arrested and considerable stolen property recovered. In Stanhope, N. J., a large number of persons have been arrested for stealing coal from the Delaware, Lackawanna & Western. It is said that local coal dealers had complained that their sales had fallen off on account of the stealings. The culprits were fined about \$3 each.

A fire at Keensburg, Ill., March 31, destroyed the Central Iowa Depot, dispatcher's office, roundhouse and pumping works, together with three locomotives, two stationary engines, several freight cars, pile drivers and caboose and a large quantity of material and supplies. Loss, \$55,000. The Buffalo, Rochester & Pittsburgh station, a hotel and several other buildings at Bradford, Pa., were destroyed by fire last Saturday morning. The hotel was full of guests, and several perished in the flames. Six or more were drowned in the creek adjoining the hotel. The total loss is estimated at \$100,000.

The "Philadelphia Market Company" is putting up a building 400 ft. long at Chestnut and Thirtieth streets, West Philadelphia, to be used as a receiving depot for fresh fruits and vegetables from the South, a contract having been made with the Pennsylvania Railroad to run its trains from the South directly to this place. It appears that under existing arrangements this freight is taken around to the east side of the city and delivered at the Dock Street station, and the dealers near this station complain at the prospective change. They say that officers of the Pennsylvania Railroad are largely interested in the company which is erecting the new building.

The New York newspapers in striving to print, on April 1, a variety of romances appropriate to the day, succeeded in producing several artistic "dispatches." The *World* had a "special" all the way from Tacoma to the effect that a Union Pacific fireman found "a great deal of gold" in the sand used on his engine. Whether or not he has set up a watch factory is left for the reader to imagine. The *Tribune* had a "special" from Chicago explaining that the suspension of work on the Chicago & St. Louis Electric Railroad during the last four months was owing to the severity of the weather. Contracts have now been given out, which "call for" the completion of the track within a year. Our feelings are calmed somewhat, however, by the statement that the third and fourth tracks will not be laid this year. The companion piece to this was a "special" from Boston showing how and why the Boston & Albany is going to spend one or two million dollars in straightening out a few curves, so as to have a moral argument with which to sustain its claim to run New York trains as fast as the Shore Line runs them. The principal feature of this proposed scheme is a tunnel or something from Charlton to Palmer, about 19 miles long.

World's Fair Notes.

The Builders Iron Foundry, of Providence, R. I., has shipped to Chicago a 36-in. Venturi meter, manufactured under the patents of Clemens Herschel, C. E., New York City. This meter will be placed in the extreme southeast corner of the grounds, and will measure the entire water supply of the Columbian Exposition (about 24,000,000 gallons a day). The recording apparatus will be exhibited in the adjacent building of the Sewage Cleansing Works.

A decision recently made by the Chicago courts will enable the Baltimore & Ohio to gain a more direct route to the World's Fair grounds than it has at present. By the present connection trains from the city must run to South Chicago and switch on a Y to the Jackson Park tracks. The decision referred to allows the company to condemn a right of way, and to build from Ninety-first street, on the north line, to the Exposition grounds. This will do away with delays due to switching at South Chicago.

Michigan's exhibit in the Mines Building will probably attract much attention. It will be displayed in a pavilion made of stone, iron ore, copper, crystallized salt, silver, gold, granite, marble, verde antique and other specimens of minerals taken from the mines and quarries of Michigan. One of the attractions inside this pavilion will be a representation of Lot's wife turned to a pillar of salt. There will also be a specimen of copper ore, as it came out of the mine 98, per cent. pure, and weighing 10,000 lbs.

Of all the exhibitors at the Exposition the German Government shows greatest determination to have its exhibits installed in time for the opening, May 1. This determination is clearly shown in the Transportation Building annex. All the German exhibits for this department have arrived and are being set up as rapidly as workmen inexperienced in the German methods of construction can do so. All the cars and locomotives

were shipped in sections, and as no mechanics familiar with the work were sent to set them up, the Wells-French company were called upon to do the work, and they are making as rapid progress as possible under the circumstances.

The most extensive display of locomotives ever made by one company at any exposition will be that in the Transportation Building by the Baldwin Locomotive Works. They will have one main exhibit of 12 locomotives of different designs in the annex to the Transportation Building, and besides these there will be three locomotives at other places. One of these will be attached to the Royal Blue Line train to be exhibited by the Baltimore & Ohio; another will be attached to the train of coaches to be exhibited by the Pullman Palace Car Company. The third will make one of the large pedestal exhibits outside of the building. The twelve locomotives comprising the main exhibit will not stand on rails but will be supported on blocks under the frames so that the engines may be operated as when running; steam will not be used in the cylinders, however, but compressed air will take its place.

Lake Notes.

Navigation on Lake Erie between Cleveland and Detroit was opened last week by the steamer "City of Detroit," which made its first trip in a little better time than is usual. The ice at Duluth is said to be 42 in. thick, but that at the straits of Mackinaw is going out fast, so that it is hoped boats can pass through by the 20th inst. This is rather a late opening, though in 1885 the straits did not open till May 5. The ice in the St. Mary's River is still very solid, which will make a late opening of the "Soo."

The opening coal rates Buffalo to Chicago or Milwaukee were definitely fixed at 60 cents, as against 40 cents last year. An effort to charter at 40 cents to Duluth was not successful. At Cleveland a few boats were placed at 50 cents for coal to the head of Lake Superior and 55 cents to Milwaukee. No freight rates on iron ore are yet reported.

Very heavy shipments of lumber for Duluth are reported probable for the season; it is said they will aggregate 100,000,000 ft. B. M. The Georgian Bay lumbermen are disturbed by an estimate that 450,000,000 ft. will be rafted across from their district to this country, and a deputation is in Ottawa City urging the Dominion government to reimpose the export duty on sawlogs shipped to this country, or increase the stumpage dues on logs from \$1 to \$8 per 1,000 ft., with a rebate on such logs as are manufactured into lumber in Canada.

With the opening of navigation a fleet of vessels carrying nearly 9,000,000 bushels of grain will leave Chicago for Buffalo and other lower lake ports. This will include some tonnage now going to Chicago from Milwaukee to load grain. Over 50 steamers and 30 schooners will carry wheat; 30 steamers and 20 schooners corn, and a dozen other boats flax and oats.

The people of Conneaut are pleased to learn that their harbor will be made the lower lake headquarters of the whaleback fleet. The McDougal-Merritt Mesabi ore syndicate will build a dock on the lake front 1,000 x 700 ft. with a slip extending the entire length, equipped with electric hoists, with a capacity of 10,000 tons of ore per day. Repair shops for the whalebacks will be erected there. Captain McDougall says all the Mesabi ore will be landed there. Two "whalebacks" which were built on the lakes and sent down the St. Lawrence some time since, will be cut in two and returned to the upper lakes, as will two that were built in Brooklyn. Captain McDougall says in relation to this: "They're a little different from the other craft. We can make more money with them on fresh water than on salt at present, as we have steady work here for them."

Electric Railroad Building.

An interesting feature of the growth of electric power as applied to transportation is the establishment of connecting lines between near-by cities and towns, many of such lines being designed as carriers of light freight as well as passengers. One of the earlier inter-urban lines was that between St. Paul and Minneapolis, which has been a marked success. The electric line between Boston and Lynn was recently acquired by a syndicate at high figures. The proposed electric road between Baltimore and Washington (40 miles) has made some progress. The Consolidated Street Railway Company, of Worcester, Mass., has applied for franchise for over 40 miles of new roads to a large number of the manufacturing towns in that vicinity. The street railways of Norwich and New London, Conn., are being consolidated and it is proposed to connect the two cities by a 15-mile road. This would compete somewhat with the New London, Northern Wilmington and New Castle, Del., are to be connected by a new electric line of 8 miles. An electric road, 70 miles long, is proposed from Lancaster, Pa., to Bryn Mawr. A 25-mile electric line is proposed between Harrisburg and Mechanicsville, Pa. A company has been incorporated to build an electric road of 80 miles from Northumberland to Scranton, Pa., and to furnish light, heat and power to intermediate towns. In Ohio a trolley railroad is projected about 100 miles long, extending from Toledo to Findlay, and designed for freight as well as passengers. A company has been incorporated in New Jersey under the name of the New England Street Railway Co. to acquire the street railroads in a large number of the cities and towns of the New England States, and operating them as one system. Another great combination has been formed designed to connect Newark, Jersey City, Elizabeth, Plainfield, Orange and other cities in New Jersey. A line is proposed between Cincinnati and Dayton, O.

It is a question if this business is not being pushed too fast. As in all other desirable investment lines careful discrimination is needed here. There are fields for profitable lines where towns are not far apart and traffic is heavy, but many an ambitious trolley line through long stretches of thinly populated country will come to grief. The Railroad Commissioners of Massachusetts give a warning against indiscriminate buying of electric railroad securities. The last report of the New Hampshire Railroad Commission argues against the granting of franchises for electric lines along public highways connecting different towns. A bill has been introduced in the Connecticut Legislature prohibiting the building of street or electric railroads to parallel existing steam roads.—*J. H. Davis & Co's Circular.*

Chicago & South Side Rapid Transit.

Chicago & South Side Rapid Transit Co.—Residents and property owners in the section east of Wabash avenue and south of Sixty-third street are making an effort to secure an extension of this road to Seventy-fifth street along the alley between Calumet and Prairie avenues. They have offered the company a cash bonus of \$100,000 to build the extension. The subscribers to the bonus ask that work on the extension be commenced not later than June 1 and completed by Sept. 1, but the

company cannot accept these conditions. It would require several months to get the right of way and to procure the necessary ordinance from the Council, and it would be impossible to get a guarantee from iron manufacturers to supply the material for the structure in the time specified; the company is paying a premium now on iron used in the stations that are being rushed to completion. The proposition, however, will be laid before the directors at their next meeting. It will be remembered that a decision was reached some time ago by the officers of the company not to purchase hereafter right of way in any direction for extensions, but if the cash bonus is equivalent to giving the right of way, action in this case will not be affected by the above-mentioned decision.

The work of increasing the facilities at the Congress street terminus, the plans of which were described in the *Railroad Gazette* of March 10, is well under way. The platform on the east of the track at this station has been decreased in width and the track moved to the east to give room for a platform on the west side; the east platform has been extended south to Harrison street and stairs built at the south end leading to the street.

The lot of 20 locomotives received from the Baldwin Locomotive Works in May, 1892, are receiving thorough repairs at the Thirty-ninth street shop that they may be in good condition for the World's Fair traffic; this work is being done under the direction of Mr. Samuel Huston, Supervisor of Machinery.

New Car Works at Elizabeth, N. J.

The J. W. Fowler Car Co., of New York, has purchased a large tract of land on First street and Port avenue at Elizabeth, N. J., and have obtained permission from the City Council to connect with the Central of New Jersey tracks. It is understood that the company will at once proceed with the erection of shops which will cover about 90,000 sq. ft. of floor space and have a capacity of four passenger cars a day.

Legal Decisions, Chicago Elevated Roads.

A verdict was rendered in the Chicago courts on March 31, in the Metropolitan West Side Elevated Railroad condemnation proceedings, which was in favor of the road, as no damages were allowed for unimproved property. Under this decision the road will pay for what ground it actually uses. The case, which was on trial for more than three weeks, involved the right of way of the proposed West Side Elevated in Chicago for a distance of two and a quarter miles, extending from Sacramento avenue to West Forty-eighth street, along Flournoy street. The verdict awards about \$125,000 to the property owners along the route, and as no damages were allowed, this will pay for the land the right of way will occupy, and the actual damage done to improvements on the property, as in the case of running too near the house. The award for damages in cases like this varied from \$100 to \$500. The defendants in the suit claimed damages in addition to the price of the land actually taken for the right of way, and maintained that they were entitled to damages where the road ran along on the back ends of lots and shortened them, holding that such occupation diminished the value of what remained. The answer of the plaintiff was that the damage done was more than repaid by the benefit extended to all the property in the vicinity of the route of the proposed road. The decision is an important one, and shows the general tendency to give all proper aid to such roads as are projected to facilitate urban travel.

The Pennsylvania Elevated at Elizabeth, N. J.

The extra work entailed by the accident detailed in last week's issue has caused a delay of several days in placing the temporary iron girders over the Morris avenue-Broad street crossing. Those portions of the temporary work that were wrecked by the fall of the 20-ton girder had to be replaced and the fallen girder raised into place. This has been done and the fourth girder placed over the north span of the North Broad street crossing. The temporary trestle to carry the traveling derrick has been taken down and re-erected across the south span of the same crossing and the four girders to span this opening have been placed in position. As soon as the tracks of the Central of New Jersey and the opening leading to the Central of New Jersey station are spanned the trestle will be continuous except for the gap left at Pearl street, which will then be closed and trains will commence running over the elevated structure on the east-bound tracks.

CAR BUILDING.

The car shops of the Florida Central & Peninsular are working on an order for 100 platform cars. It is said that orders for a number of box cars will be given to the shops shortly and that they will be in full operation during the summer.

The Norfolk & Western has ordered 15 passenger cars built at the shops of Billmeyer & Small, York, Pa. Eight of these cars are to be vestibuled, and each will have a smoking compartment. Seven cars are designated as second class, but they are to have all conveniences and are really handsome cars.

BRIDGE BUILDING.

Cincinnati.—The Brackett Bridge Co. of Cincinnati, has purchased 12 acres of land in Springfield Township near this city, and will at once erect large foundries and machine shops for the construction of iron and steel bridge material. About 500 men will be employed in the new shops. Most of the bridges built by the company are county and highway structures.

The Cincinnati, Lebanon & Northern has agreed to pay \$1,500 toward the cost of an overhead bridge over the railroad tracks at Kennedy Heights, which the Hamilton County Commissioners propose to build.

Kingston, Ont.—Chief Engineer La Fleur, of the Public Works Department at Ottawa, took soundings in the St. Lawrence River last week for a proposed bridge connecting Howe Island, in the River St. Lawrence, east of Kingston, with the mainland. It is stated that the engineer will recommend the building of a swing bridge to be about 1,300 ft. long at a site near O'Brien's Ferry.

Macon, Ga.—A proposition to build a new bridge across the Ocmulgee River at Second street, Macon, is being discussed, and the proposal to erect such a structure, which will cost \$20,000, will soon be submitted to the County Commissioners.

Middletown, Conn.—The opposition to the erection of a proposed toll bridge over the Connecticut River, between Middletown and Portland, by the river steamer

lines has been withdrawn, the bridge company having modified its plans to provide for a span of not less than 400 ft. Charles J. Cole, of Hartford, and C. M. Jarvis and B. K. Field, of East Berlin, are directors of the bridge company.

New Brunswick.—A return laid before the legislature shows an expenditure of \$195,453 on bridges in the Province of New Brunswick last year. The heaviest items are on the Moncton bridges, \$35,971, and on the Woodstock bridge, \$50,179.

New Westminster, B. C.—Arrangements have been finally made for the construction of a railroad and wagon bridge across the Fraser River at New Westminster, B. C. The bridge will cost \$500,000, and the Burrard Inlet & Fraser Valley road, a branch of the Northern Pacific, will pay half of the cost, and the city of New Westminster the balance. The Provincial Government will pay the interest and sinking fund on the bonds for 10 years.

New York City.—The Department of Public Works opened bids March 28 for the construction of the swing bridge over the Harlem ship canal at Kingsbridge, N. Y., of which we gave a description in our issue of March 10. Alternative bids were asked for masonry with granite and with limestone above M. L. W. There were five bidders, and their tenders for granite and limestone masonry respectively are as follows: (1) McMullan & Breuchand, \$356,133 and \$334,927; (2) Christie & Lowe, \$404,943 and \$382,629; (3) Steward & McDermott, \$447,089 and \$384,209; (4) Sooysmith & Co., \$468,965 and \$419,590; (5) T. & A. Walsh, \$3,974,544 and \$3,947,967. The last bid contains a bid of \$4.25 per pound of metal, which was evidently intended to be 4.25 cts.; this would have made the bids \$410,792 and \$384,209. The contract has been awarded to McMullan & Breuchand. Prof. W. H. Burr is the Consulting Engineer of the work, and W. G. Triest, 71 Broadway, New York, is Assistant Engineer.

Sioux City, Ia.—The Missouri River Bridge Co. was incorporated this week with a capital stock of \$2,500,000. The company is composed of James O. Pease, Sidney L. Wright and William Redwood Wright, of Philadelphia, and A. G. Garrison, F. C. Hill and others of Sioux City. The company has purchased the franchises of the Pacific Short Line Bridge Co., now constructing a combination railroad and wagon bridge across the Missouri River at Sioux City, and will complete it.

Spokane, Wash.—The County Commissioners have decided upon a site for the bridge at Deadman Creek, which the residents in that city have petitioned for, and plans are now being prepared. The bridge will be a wooden structure about 400 ft. long and 75 ft. high.

MEETINGS AND ANNOUNCEMENTS.

Dividends:

Dividends on the capital stocks of railroad companies have been declared as follows:

Delaware, Lackawanna & Western, quarterly, 1½ per cent., payable April 20.

Stockholders' Meetings:

Meetings of the stockholders of railroad companies will be held as follows:

Akron & Chicago Junction, annual, Cleveland, O., April 19.

Atlantic Avenue Elevated, annual, Brooklyn, N. Y., April 18.

Cincinnati, Jackson & Mackinaw, annual, Toledo, O., May 1.

Cleveland, Wooster & Muskingum, annual, Cleveland, O., April 19.

Delaware & Hudson Canal, annual, New York City, May 9.

Lake Shore & Michigan Southern, annual, Cleveland, O., May 3.

Louisville, New Albany & Chicago, special, Indianapolis, Ind., April 12, to consider an increase of stock.

Mexican Central, annual, Boston, Mass., May 3.

Michigan Central, annual, Detroit, Mich., May 4.

Mohawk & Malone, special, Albany, N. Y., April 19, to approve of the lease to the New York Central & Hudson River.

New York Central & Hudson River, annual, Albany, N. Y., April 19.

New York, Chicago & St. Louis, annual, Cleveland, May 3.

New York & South Beach, annual, 111 Broadway, New York City, April 13. This is a proposed electric railroad.

Northern Pacific, special, New York City, April 20.

Pittsburgh, Cincinnati, Chicago & St. Louis, annual, Pittsburgh, Pa., April 11.

Southwestern, special, Macon, Ga., April 12.

Staten Island Rapid Transit, annual, New York City, April 25.

Union Pacific, annual, Boston, Mass., April 26.

Union Pacific, Denver & Gulf, annual, Denver, Col., April 11.

Technical Meetings:

Meetings and conventions of railroad associations and technical societies will be held as follows:

The Association of American Railway Accounting Officers will hold its fifth annual meeting at the Auditorium Hotel, Chicago, commencing May 31.

The Railway Agents' Association of North America will meet at Old Point Comfort, Va., on Tuesday, May 16.

The Western Railway Club meets at the rooms of the Central Traffic Association in the Rookery Building, Chicago, on the third Tuesday in each month, at 2 p. m.

The New York Railroad Club meets at the rooms of the American Society of Mechanical Engineers, 12 West Thirty-first street, New York City, on the third Thursday in each month, at 7:30 p. m.

The Northwest Railroad Club meets at the Ryan Hotel St. Paul, on the second Tuesday of each month, except during June, July and August, at 8 p. m.

The Northwestern Track and Bridge Association meets at the St. Paul Union Station on the Friday following the second Wednesday of March, June, September and December, at 2:30 p. m.

The American Society of Civil Engineers meets at the House of the Society, 127 East Twenty-third street, New York, on the first and third Wednesdays in each month.

The Boston Society of Civil Engineers meets at Wesleyan Hall, Bromfield street, Boston, on the third Wednesday in each month, at 7:30 p. m.

The Western Society of Engineers meets at 78 La Salle street, Chicago, on the first Wednesday in each month, at 8 p. m.

The Engineers' Club of St. Louis meets in the Odd

Fellows' Building, corner Ninth and Olive streets, St. Louis, on the first and third Wednesdays in each month.

The Engineers' Club of Philadelphia meets at the House of the Club, 112 Girard street, Philadelphia, on the first and third Saturdays of each month, at 8 p. m.

The Engineers' Society of Western Pennsylvania meets at its rooms in the Thaw Mansion, Fifth street, Pittsburgh, Pa., on the third Tuesday in each month, at 7:30 p. m.

The Civil Engineers' Club of Cleveland meets in the Case Library Building, Cleveland, O., on the second Tuesday in each month, at 8 p. m. Semi-monthly meetings are held on the fourth Tuesday of each month.

The Engineers' Club of Cincinnati meets at the rooms of the Literary Club, No. 24 West Fourth street, Cincinnati, O., on the third Thursday in each month at 8 p. m.

The Engineers' Club of Kansas City meets in Room 200, Baird Building, Kansas City, Mo., on the second Monday in each month.

The Engineering Association of the South meets on the second Thursday in each month, at 8 p. m. The Association headquarters are at Nos. 63 and 64 Baxter Court, Nashville, Tenn.

The Denver Society of Civil Engineers meets at 36 Jacobson Block, Denver, Col., on the second and fourth Tuesdays of each month except during July, August and December, when they are held on the second Tuesday only.

The Civil Engineers' Society of St. Paul meets at St. Paul, Minn., on the first Monday in each month.

The Montana Society of Civil Engineers meets at Helena, Mont., on the third Saturday in each month, at 7:30 p. m.

The Engineers' Club of Minneapolis meets in the Public Library Building, Minneapolis, Minn., on the first Thursday in each month.

The Canadian Society of Civil Engineers meets at its rooms, 112 Mansfield street, Montreal, P. Q., every alternate Thursday except during the months of June, July, August and September.

The Technical Society of the Pacific Coast meets at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., on the first Friday in each month, at 8 p. m.

The Tacoma Society of Civil Engineers and Architects meets in its rooms, 201 Washington Building, Tacoma, Wash., on the third Friday in each month.

The Association of Engineers of Virginia holds informal meetings the third Wednesday of each month, from September to May inclusive, at 710 Terry Building, Roanoke, at 8 p. m.

The Civil Engineers' Association of Kansas meets at Wichita, Kan., on the second Wednesday of each month, at 7:30 p. m.

The American Society of Swedish Engineers meets at the clubhouse, 250 Union street, Brooklyn, N. Y., and at 347 North Ninth street, Philadelphia, on the first Saturday of each month.

American Railway Association.

The spring meeting of the American Railway Association will be held at the Grand Pacific Hotel, Chicago, on Wednesday, April 12, at 11:00 a. m. Reports will be presented by the Committee on Train Rules, Committee on Car Service, Committee on Safety Appliances, and the Joint Committee on Interlocking and Block Signals. The annual election of officers will take place at this meeting. Two members of the Executive Committee and three members of the Committee on Train Rules will also be elected.

American Society of Civil Engineers. The paper read at the meeting on the evening of April 5 was by Walter McCulloch, Jun. Am. Soc. C. E., "On the Construction of a Water-Tight Masonry Dam."

The dam described is the Sodom Dam on the Croton Aqueduct system. This dam spans a gorge and is 500 ft. long at the coping line, which is 78 ft. above the river bed. The greatest height of the dam (above rock) is 98 ft., thickness at bottom is 53 ft. and, under the coping 12 ft. The total batter on the lower face is 37 ft., decreasing from 9.3 in 10 to 2.7 in 10. The batter on the back is 10 per cent. up to 38 ft. below the top and plumb above that point. The gatehouse is 37 x 42 ft. and rises 23 ft. above the dam near the centre. The discharge is through two 48-in. pipes, which pass through the body of the dam. The work was begun Feb. 22, 1888, and completed and accepted Oct. 31, 1892, nearly three years after the date fixed by contract.

The floods in the stream rise suddenly and the discharge in a spring freshet reaches 250,000 cu. ft. per minute. To control this during construction a timber crib dam was thrown across the river about 80 ft. above the site of the work, and a canal cut 28 ft. wide and 15 ft. deep on the west side and around the work to a point 500 ft. below. The gatehouse and eastern half of the dam were then built to about 25 ft. above the discharge pipes, and in the dry season of 1889 the water was turned through the pipes and the other half of the dam started.

In preparing the foundation all loose rock was removed by dynamite; and, afterward, all loose seams or shakes by blasting with black powder and barring out. The foundation was swept with wire stable brooms and washed clean. All pockets or holes were then filled with rich Portland cement concrete. A tighter bond, it was found, could be made with rubble consisting of small stones, than with concrete beds. Water entered through several seams in the rock and would wash the mortar out of the concrete, but it could be led around the rubble beds, until finally a small well 2 ft. in diameter and 1 ft. deep was formed at the point where the water boiled up. After the mortar had set the well was bailed out and filled quickly with dry mortar; on top of this a bed of stiff wet mortar was laid and capped by a large rubble stone. After the first 8 ft. of the rubble foundation had been placed there was no further trouble.

The dam for about 40 ft. of its height is of rubble masonry laid in Portland cement mortar, mixed 2 to 1.

Above this there was facing stone, 30 in. deep, laid in 2 to 1 Portland cement mortar, backed with rubble in mostly 2 to 1 mortar. The rubble stones varied from a cubic foot to a cubic yard in bulk, and were laid in full beds of mortar. There were no through horizontal joints. Joints were filled with mortar, into which as many stone spalls were forced as was possible. All stone was washed before using. Sand and cement were mixed dry, and then wet only when required. Stretchers were 3 to 6 ft. long by 30 in. wide, and headers 4 ft. long. The thicknesses of courses diminished from the bottom up. The beds were at right angles to the face, and the stone had to be held in place with wooden blocks and wedges, to prevent slipping until the mortar had set, after which the blocking was removed and spaces left were filled with rubble.

Stone setting was done by the use of the cable, the traveler and derricks. The cable consisted of a 2½-in. steel wire cable, stretched over and parallel to the dam,

and over towers 667 ft. apart and anchored in the bedrock. On this a trolley ran which was worked by a double-drum reversible engine. A load of 10 tons would sag the cable 25 ft. with a clearance of 5 ft. above the coping. Most of the excavation was removed, and all material delivered on the wall in this manner. When the wall had reached a point 31 ft. below the top, the standing derricks were replaced by a traveling derrick, mounted on a 30-ft. trestle and running on a track of 36-ft. gauge; a boom 55 ft. long was used with this derrick.

The most serious flood occurred in November, 1889, when 3.8 ins. of rain fell in 18 hours, and 8.7 ins. during the month. In eight hours after the rain had ceased, the water rose to ten ft. behind the dam, and in 12 hours to 15 ft., and poured over the top of the dam, although both 48-in. pipes were discharging to their full capacity. No serious damage followed, as part of the dam over the channel was kept 4 to 5 ft. lower than the balance of the wall.

The final estimate for the dam and appurtenances was \$436,499. The lowest bid received at the letting was \$366,990; the highest, \$583,315, and the engineers', \$540,030. The difference between bid and estimate was due to modifications in the plans.

The dam is water-tight. With 68 ft. of water behind it, no leaks whatever have been found, either through or under the wall, or around the ends. Sweating at the joints appears at points, but not so much as to cause a trickle; but it cannot be seen on a dry day. The contractors were Messrs. Sullivan, Rider and Dougherty.

American Society of Railroad Superintendents.

A special meeting of the Society will be held at the Grand Pacific Hotel, Chicago, on Monday, April 10. It will be called to order at 10:30 a. m., and the principal business will be: Election of President to fill the vacancy caused by the death of H. Stanley Goodwin; reports from committees; discussion upon the following topics: (a) Papers and reports read at the last meeting; (b) Recent improvements in signal practice; (c) Experience in working under the Standard Code; (d) Methods of examining and instructing railroad employees and the adoption of a railroad catechism; (e) How can we increase the usefulness of our Society?

It is hoped that this meeting will be largely attended, and the usual invitation is extended to all railroad superintendents to be present. Members attending will have the opportunity of participating in excursions to the grounds of the World's Columbian Exposition and other points of interest.

The Central Railway Club.

The Central Railway Club requests suggestions from persons or clubs with regard to changes in the Rules of Interchange. These should be sent not later than April 7, and will be discussed at the next regular meeting of the club. Replies should be addressed to Mr. S. Higgins, Assistant Superintendent Motive Power, New York, Lake Erie & Western Railroad, Cleveland, O.

Master Car and Locomotive Painters' Association.

Robert McKeon, of Kent, O., Secretary of the Association, announces that the twenty-fourth annual meeting will be held at Milwaukee, Wis., beginning Sept. 13. He announces that the following subjects will come up for discussion, and reports are expected from the respective committees. (1) Classification of paint shop repairs on passenger cars. (2) Best method of preparing cloth head linings for passenger cars. (3) Progress in car painting due to organized association. (4) Method of preparing a new steel tank for painting. How should the scales and rust be removed from a common iron tank? (5) The advantages, if any, which might accrue to the members of the Association by the appointment of a standing Arbitration Committee. (6) In cutting in a passenger car with body color, do you use it mixed the same way as when giving it a general painting? (7) How should natural wood doors and sash be finished so as to stand the action of the weather?

National Convention of Railroad Commissioners.

The call for the fifth annual convention of railroad commissioners, to be held at Washington, D. C., on April 19, has been issued by the committee.

The railroad commissioners of all states, and state officers charged with any duty in the supervision of railroads or railroad interests, are requested to attend, and the Association of American Railway Accounting Officers is invited to meet with the commissioners or to send delegates.

At the last convention committees were appointed on the following subjects and directed to report to the next convention: 1. Reasonable rates; 2. Congressional action in regard to safety appliances; 3. Amendment of the act to regulate commerce; 4. Uniformity in railroad accounts.

The following additional topics are suggested for consideration at the coming meeting: 5. Uniform classification of freights; 6. Pooling of freights and division of earnings; 7. Abuses caused by use of shippers' cars in railway equipment; 8. Harmony in railway legislation; 9. Territorial assignment of statistics of operation; 10. Overcharges.

Members desiring to bring up other topics should notify Edward A. Moseley, Secretary, at Washington, before the day of meeting. The committee calling the meeting consists of Eugene P. Jersey, Chairman, late Railroad Commissioner of South Carolina; George M. Woodruff, of Connecticut; Alfred C. Chapin, of New York; J. M. Buckley, of Washington, D. C.; Henry R. Shorter, of Alabama.

New England Railroad Club.

The regular meeting of the club will be held at the United States Hotel, Boston, Wednesday, April 12, 1893, at 7:30 p. m. The subject for discussion is, "The Past Winter's Experience in Continuous Heating of Passenger Trains."

PERSONAL.

—Mr. Thomas A. Shoemaker has resigned as Superintendent of the Bellefonte Central road in Pennsylvania.

—Mr. C. R. Capron, General Freight and Passenger Agent of the Winona & Southwestern, has resigned, taking effect April 1.

—Mr. J. T. Wann, for a number of years Auditor of the New York, Pennsylvania & Ohio, has resigned to accept the position of cashier of a new bank at Cleveland, O.

—Col. John J. Lawrence, who died at his home in Allegheny City, March 27, was at various times Superintendent of the Huntingdon & Broad Top road, and General Manager of the Allegheny Valley line. He was 66 years of age.

—Mr. F. C. Watson, General Ticket Agent of the

Connecticut River road, has resigned to accept a position as Superintendent of the large tool manufacturing establishment of O. W. Bullock, at Springfield, Mass. Mr. Watson has occupied the position 13 years.

—Mr. Robert Blee, formerly General Superintendent of the Cleveland, Columbus, Cincinnati & Indianapolis, the old "Bee Line," was elected Mayor of Cleveland, O., at the election on April 3, by a plurality of over 1,500 votes. He was the candidate on the Democratic ticket.

—Mr. John H. Green, General Agent of the passenger department of the Chicago Great Western, with office at Des Moines, Iowa, has resigned. Mr. Green has been General Agent for two years, and before that was City Ticket Agent at Des Moines. The office of General Eastern Passenger Agent in New York City has been abolished.

—President A. A. McLeod tendered his resignation as President and as Receiver of the Philadelphia & Reading on April 4, to take effect May 1. He announces that his reason for resigning is a belief that needed financial assistance will not be accorded to the Philadelphia & Reading as long as he retains his present position.

—Mr. Thomas Dolan, the well-known textile manufacturer, of Philadelphia, has resigned from the Board of Managers of the Philadelphia & Reading Railroad Co. Mr. Dolan was appointed a director in 1890, during Austin Corbin's presidency. He represented an interest which wanted representation on the board, and he and Mr. Gibson were chosen.

—Mr. Lewis F. Root, a well known civil engineer of Western Massachusetts, died at his home in Westfield, Mass., on March 31, at the age of 65. Mr. Root was engaged on the construction of the Union Pacific, in Utah, for a short time, but aside from that his career, long and honorable one, had been wholly in Massachusetts. He was Chief Engineer of the New Haven & Northampton Railroad for 30 years, and had been County Commissioner of Hampden County 14 years. He held this office at the time of his death.

—Mr. C. O. Wheeler has resigned the office of General Manager of the Gulf, Colorado & Santa Fe, and will be succeeded by Mr. B. F. Yoakum, late of the San Antonio & Aransas Pass road. The changes will take effect on April 17. Mr. Wheeler assumed the general management of the Gulf, Colorado & Santa Fe on Oct. 1, 1890. Prior to that time he was the General Superintendent of the Chicago, Santa Fe & California, but on the resignation of J. S. Scott he was appointed by the late President Manvel, General Manager of the Gulf, Colorado & Santa Fe. Mr. Wheeler began his railroad career on the Michigan Central in 1855, and remained in the employ of that company until 1881. When he severed his connection with the Michigan Central Mr. Wheeler became identified with Mr. Manvel in his railroad enterprises in the Northwest and was with the Great Northern, then the Manitoba, for a year, then with the Wisconsin Central for two years, and when Mr. Manvel was elected to the Presidency of the Atchison system Mr. Wheeler became Superintendent of the Chicago Division. Mr. B. F. Yoakum, who now becomes General Manager of the Gulf, Colorado & Santa Fe, was connected with the San Antonio & Aransas Pass road, practically from its inception, as General Manager. He was also one of the Receivers.

ELECTIONS AND APPOINTMENTS.

Birmingham & Atlantic.—J. C. Bowie, of Talladega, Ala., has been appointed Assistant Secretary and Assistant Treasurer, vice W. H. Skaggs, previously Secretary and Treasurer, resigned.

Boston & Maine.—A circular was issued on April 4 extending the authority of its general officers over the Connecticut River road and discontinuing the office of general manager of that road. George S. Evans, Superintendent of the Southern Division of the Boston & Maine, who was appointed Acting General Manager of the Connecticut River road, is thus relieved, and his duties will be assumed by Acting General Manager John W. Sanborn, of the Boston & Maine.

California & Northeastern.—The officers of this California company are: D. E. Miles, President, Castle Crag, Shasta County, Cal.; J. J. Bowen, Vice-President; A. I. Tatum, Treasurer, and A. M. Willis, Secretary, all of 34 Fremont street, San Francisco.

Central of Georgia.—The position of Purchasing Agent, left vacant by the resignation of J. F. Babbitt, Jr., as announced last week, has been filled by the appointment of J. W. Comer, a brother of Receiver H. W. Comer.

Chesapeake & Ohio.—President Ingalls has decided to divide the system into two general divisions, and beginning April 1 the Peninsula, Richmond, Washington and James River divisions will be known as the Eastern Division; the Huntington, Cincinnati, Lexington and Big Sandy divisions as the Western Division.

Chicago & Alton.—The annual meeting was held at Chicago, April 3, and the retiring directors and old board of officers were re-elected. The three directors whose terms had expired were J. C. McMullin, J. A. Stewart and A. A. Sprague. The officers are as follows: President, T. B. Blackstone; Vice-President, J. C. McMullin; Secretary and Treasurer, C. H. Foster; General Manager, C. H. Chappell; General Solicitor, William Brown; Auditor, Chauncey Kelsey.

Chicago Great Western.—D. McNab has been appointed Superintendent of Telegraph, with office at Alpena, Ia., vice J. C. Ford. J. C. Ford has been appointed Division Superintendent, with headquarters at Kansas City, Mo., vice J. A. Kelly, transferred. J. A. Kelly has been appointed Division Superintendent, with headquarters at Chicago, Ill., vice D. McNab.

Cincinnati Southern.—F. J. Jerber has been appointed Master Mechanic in charge of the shops at Ludlow, Ky.

Denver & Rio Grande.—H. E. Tupper has been appointed General Eastern Agent, 379 Broadway, New York City, in place of T. W. Becker, resigned.

Duluth, Missabe & Northern.—G. H. White has been appointed Superintendent, and J. B. Hanson, Auditor, with office at Duluth, Minn.

Elgin, Joliet & Eastern.—H. F. Hawley, recently Assistant Superintendent of the Chicago Division of the Chicago & Alton, has been appointed Assistant Superintendent of this road with headquarters at Joliet, Ill.

Houston & Shreveport.—Joseph Richardson has been elected President of this company, and M. G. Howe General Manager, office at Houston. Mr. Howe was formerly Receiver,

Houston & Texas Central.—This road, which has been in the hands of a receiver since 1885, was transferred to the stockholders on April 4. At a meeting of the stockholders the following were elected directors: Gen. Thomas W. Hubbard, of New York, and Messrs. C. W. Bein, E. W. Cave, T. W. House, J. M. Lee, G. A. Quinlan, J. Kruttschnitt, J. Atkinson and A. R. Roof, of Houston. The directors elected the following officers: Gen. Thomas W. Hubbard, President; G. A. Quinlan, Vice-President.

Hutchinson & Southern.—Otto Miller has been appointed Superintendent of this road, with office at Hutchinson, Kan., in place of O. P. Byers, resigned.

Lake Shore-Lehigh Valley Route.—Charles E. Sayre has been appointed agent of the Lehigh Valley line in New York City, taking the place of C. H. Goodrich, resigned. His office will be at 235 Broadway. Mr. Sayre is a nephew of Robert H. Sayre, Vice-President of the Lehigh Valley Railroad.

Mexican Central.—The following appointments take effect from April 1: Adam Hoffman, General Freight Agent; E. A. White, General Passenger Agent and H. B. Wilkins, General Eastern Agent. The headquarters of the two first mentioned officers will be in the City of Mexico, and Mr. Wilkinson will be stationed in New York City. Mr. Hoffman was, for some time, Assistant General Freight Agent of the Mexican National, leaving that position on May 16, 1892, to accept that of Traffic Manager of the Monterrey & Mexican Gulf, which he now holds. Mr. White was, from 1887 to 1892, Chief Clerk in the general freight and passenger offices. On Feb. 1, 1892, he was appointed to the position of Assistant General Freight and Passenger Agent, which position he gives up to take the one above mentioned. Mr. Wilkins has been for some time Assistant General Freight and Passenger Agent, and for some months past has been in charge of the general freight and passenger business of the road.

Morristown & Cumberland Gap.—Jackson Smith has been appointed Receiver of this company, vice W. S. Whitney. F. P. Tate has been appointed Auditor, both with offices at Morristown, Tenn.

New York Central & Hudson River.—J. R. Leonard has been promoted from the position of Trainmaster to that of Assistant Superintendent of the Mohawk Division.

Norfolk, Fairfield & Southern.—The stockholders of the company have elected the following directors: J. F. Lang, John D. Williamson, T. F. Hildreth, S. E. Crawford, C. P. Wickham, F. H. Evans and H. H. Hoyt. The directors have elected the following officers: President, John A. Williamson; Vice-President, T. F. Hildreth; Secretary, J. F. Lang; Treasurer, F. H. Evans. The company's office is at Norwalk, O. It has recently been chartered in Ohio.

Ohio & Mississippi.—The title of L. C. Fritch, formerly Engineer of Maintenance of Way of this company, is now Chief Engineer. This office was formerly held by C. C. Chandler, who resigned some months ago. Mr. Fritch's office will be at Cincinnati.

Panama.—The stockholders of the company elected the following directors on April 3, at the company's office, No. 29 Broadway, New York City: John Newton, Charles Coudert, Robert A. Cheseborough, E. A. Drake, Ernest L. Oppenheim, Samuel R. Probasco, J. Edward Simmons, D. Lowber Smith, Samuel M. Felton, Xavier Boyard, William B. Franklin, J. H. Parker and W. H. Cromwell. The directors elected these officers: John Newton, President; J. Edward Simmons, Vice-President; E. A. Drake, Secretary, and Ernest L. Oppenheim, Treasurer. A. L. Rives was elected General Superintendent. Mr. Simmons takes Charles Coudert's place as Vice-President. Mr. Drake was formerly Assistant Secretary.

Pan-American.—At a meeting of the directors recently held at Victoria, Tex., the following directors were elected: J. S. Anthony, James M. Cropley, George H. Hatch, J. J. Sullivan and William Weimer, of Boston; J. M. Brownson, J. J. Waelder and J. A. McFadden, of Victoria, Tex., and R. J. Kleberg, of Corpus Christi, Tex.

Pennsylvania Co.—J. T. Brooks, Second Vice-President and General Counsel of the Pennsylvania lines west of Pittsburgh, has resigned the latter position, and has been succeeded by his brother, J. J. Brooks, who has been Assistant Counsel.

Pittsburgh, Marion & Chicago.—F. W. Lockwood, of New York, has been elected President.

Salt Lake & Los Angeles.—At the annual meeting held in Salt Lake City, Utah, last week, N. W. Clayton was elected President, to succeed George I. Cannon. T. G. Webber was elected Vice-President, and Spencer Clawson, Heber Wells and T. G. Webber were elected Directors. Mr. Clayton has been General Manager of the road.

San Francisco & North Pacific.—This road was transferred formally on March 27 to the Foster-Smith syndicate, who bought the 42,000 shares stock owned by the Donahue estate. After the transfer of the stock the old Board of Directors held a meeting, and John F. Burdin, formerly President; Peter J. McGlynn, formerly General Passenger and Ticket Agent, and Charles F. Hanlon, formerly General Counsel, resigned, and A. W. Foster, Sidney V. Smith and Andrew Markham were elected directors to fill the vacancies. Arthur W. Foster was then elected President, and Sidney V. Smith, General Counsel. The Board of Directors is now as follows: Arthur W. Foster, Philip N. Lillenthal, who continues as Vice-President; Sidney V. Smith, Andrew Markham, Alfred L. Selligman, Henry T. Scott, and Russell J. Wilson.

Savannah, Americus & Montgomery.—J. A. McDuffle has been appointed General Eastern Agent of this road, with headquarters at 370 Broadway, New York.

Sherman, Shreveport & Southern.—A circular has been issued announcing that the office of vice-president and general manager has been abolished for the present, and the duties of that office will devolve upon General Superintendent E. M. Alvord until the annual meeting on May 26.

Sterling Mountain.—At the annual meeting in New York City, April 4, the following directors were elected: James P. Scott, MacGrane Coxe, Jay Cooke, Jr., William B. Anderson, Victor Guillen, Peter T. Barlow, James Day Rowland. The following officers were elected: President, MacGrane Coxe; Secretary, Jay Cooke, Jr.; Treasurer, Benjamin Moffatt, Jr.

Suwannee River.—Charles W. White has been appointed Traffic Manager of this road, office at Ellaville, Fla.

Texas & Pacific.—J. W. Addis has been appointed Superintendent of Motive Power and Rolling Stock, with office at Marshall, Tex., vice A. S. Douglas, resigned on account of ill health.

A. J. De Russy has been appointed Pacific Coast Freight and Passenger Agent with headquarters at San Francisco, vice L. M. Fletcher resigned. W. A. Murden has been appointed to succeed Mr. D. Russy as General Western Agent, with office at Denver, Col.

Toledo & Ohio Central.—W. H. Lovekin has been appointed Superintendent of Telegraph of the Toledo & Ohio Central and of the Kanawha & Michigan, with headquarters at Toledo, O.

West Virginia Central.—President Boudrou announces that the annual meeting was held in Philadelphia on March 30 and that the old officers and directors were re-elected. Alexander Boudrou, of 1729 North Tenth Street, Philadelphia, is President and Treasurer, and F. T. Clark is Vice-President and Secretary. This road is projected across West Virginia.

Wheeling & Lake Erie.—F. J. Stout has been appointed Superintendent of Transportation. C. A. Shackford has been appointed Engineer of Maintenance of Way, both with office at Toledo, O.

Winchester & Potomac.—At the annual meeting held at Winchester, Va., April 2, William N. Atkinson resigned as a director and was succeeded by Thomas J. Cooper. W. N. Atkinson was elected Secretary and Treasurer for the unexpired term of Dr. Wm. A. McCormick.

RAILROAD CONSTRUCTION. Incorporations, Surveys, Etc.

Atlantic & Lake Superior.—The bill to incorporate the Atlantic & Pacific road, which has been pending in the Dominion Parliament for some time, has passed that body, the name of the new company being changed as above. The principal projector is C. N. Armstrong, of Montreal. The charter is very general and gives the company power to build from Sault Ste. Marie to Montreal. It also amalgamates the Baie des Chaleurs, the Great Eastern, the Montreal & Sorel Railway, the Montreal Bridge Co., the Ottawa Valley Railroad Co., the Pontiac & Pacific Railway and the Ontario & Pacific Railway Co. into one company.

Bangor & Aroostook.—C. P. Treat, of Chicago, who has the contract for building this road between Brownville and Presque Isle, Me., is letting the sub-contracts for 50 miles of the grading from Brownville north toward Houlton. The contractors already on that portion of the road are: Duffy Brothers, of Bangor, Me.; J. A. Wheaton and A. E. Trites, of Salisbury, Me.; G. E. Wilkins, Presque Isle, and Joseph McVay, St. Stephen, N. B. The work near Houlton was partly done last season. The contractors now on this portion are: W. O. Johnson and Joseph McLaughlin, of Cedar Rapids, Ia.; John E. Stewart, of Houlton, Me.; A. A. Gillis, of Dyer Brook, Me., and Milbery & Martin, of Houlton, Me. The force of sub-contractors is being largely increased and quite a number are preparing to move into the work, and another two weeks will have the line fully covered with contractors and men.

Butte, Anaconda & Pacific.—The contractors are now getting along rapidly on the construction work, and there is very little to delay the tracklaying between Butte and Anaconda, Mont. The ties have been distributed for a considerable part of the way through the Deer Lodge Valley. Some men are still at work on the rock excavation in the gorges and the bridgeheads are erecting structures at various places. There will be two high bridges on the main line, one 55 ft. high and the other 75 ft. high. The road will connect with the Montana Central near the southern limits of Butte and will make a belt line around that city, reaching most of the mines. The distance to the smelters at Anaconda is 20 miles.

California & Northeastern.—This road is being built in the northern counties of California by the Red Cross Lumber Mill Company, of San Francisco and Castle Crag, Cal. The road has been surveyed from Castle Crag, Shasta County, to Bartles, Siskiyou County, in the McCloud Valley, a distance of 30 miles. About five miles of the line has been finished, and it is proposed to build 10 miles additional this summer. The company is building the line with its own men, about 75 being at work at present. The work on the first five miles about to be built will be very heavy, but on the balance of the line it will be average work. It has been proposed to extend the line beyond Bartles north, across the California State line to Klamath Falls, Or., by way of Fall River in Shasta County, Cal., and this extension will be built if the towns vote the subsidies asked. The road now being constructed is built principally to give an outlet to and develop one of the largest tracts of sugar pine timber in this country. The valley is so completely surrounded by mountains that this railroad will be the only outlet for the timber.

Canadian Railroad Subsidies.—The Canadian Minister of Railways last week asked Parliament to ratify a bill granting the sum of \$1,000,788 to be expended in aiding the construction of railroads in the Dominion, allotted as follows: To the Great Eastern, for 20 miles, \$64,000; United Counties, for 32 miles, \$102,400; Ontario, Belmont & Ottawa, for 10 miles, \$32,000; Central Ontario, for 20 miles, \$64,000; Quebec & Lake St. John, for 30 miles from Lake St. John toward Chicoutimi, Que., \$81,040; Irondale, Bancroft & Ottawa, for 50 miles from the Grand Trunk road to the village of Bancroft, Ont., \$145,000; Beauharnois Junction, for 30 miles from St. Martin toward St. Anicet, Que., \$35,500; St. Stephen & Milltown, for 3½ miles from St. Stephen to Milltown, N. B., \$11,200; Quebec, Montmorency & Charlevoix, for 30 miles from the River St. Charles to Cape Tourmente, N. B., \$30,400; Ottawa & Gatineau Valley, for 62 miles from Hull Station north toward Le Desert, Que., \$89,248; Grand Trunk, Georgian Bay & Lake Erie, for 15 miles from Tara to the town of Owen Sound, Ont., \$48,000; Nova Scotia Central, \$4,500; Great Northern, for 18 miles from New Glasgow to Montcalm, Que., \$25,600; Great Northern, for 18 miles from Montcalm to the Canadian Pacific, between Joliette and St. Felix de Valois, Que., \$18,000; Montford Colonization, for 21 miles of narrow gauge road from Lachute, St. Jerome, or a point at or near St. Sauveur, Que., \$67,200; Maskinonge & Nipissing, for 30 miles, \$96,000; Parry Sound Colonization, for 40 miles from Parry Sound to Sundridge, Ont., \$97,600.

The supplementary estimates passed by the Dominion Parliament last week provided for a capital expenditure of \$400,000 for railroads and canals, including \$157,000 for the Cape Breton Railway, and \$20,000 for an extension of the North Sydney branch to deep water terminus. There is \$25,000 for an extension of the Intercolonial along the front of St. John City, N. B., and \$24,000 to purchase two locomotives to haul combined Intercolonial and Canadian Pacific trains between Halifax and Moncton. For the ship channel, Montreal and Quebec, \$80,000. In Ontario there is \$12,000 for extension to piers and repairs to Port Stanley harbor. There is \$20,000 for steam service between St. John, Yarmouth and Halifax.

Central Railway & Terminal.—Articles of incorporation have been filed under this name in Missouri. The object is to construct a road from Plattsburg, in Daviess County, to St. Joseph, and from the latter place to the Missouri River Railroad Bridge, in Ray County, known as Sibley's Bridge. The length of the road is 120 miles. The directors are R. T. Davis, John Townsend, W. M. Rush and others, of St. Joseph, Mo.

Chesapeake & Ohio.—The engineering corps which this company has at work on the proposed branch from the main line at Barboursville, W. Va., east of Huntington, southeast up the Guyandot River, has run a line as far as Guyan Falls, about 20 miles from the starting point. Orders have been issued for the preliminary line to be continued as far as Logan Court House, in Logan County, a distance of about 50 miles. All this distance the line is to follow the east side of the river, if possible. The grades are all easy, and there will be no very expensive construction.

Chicago, Greenville & Southern.—Some of the citizens of Carlyle, Ill., are endeavoring to get subscriptions for a subsidy for an extension of this line, which is part of the Jacksonville Southeastern system, from Greenville south to Carlyle. The road was extended to Greenville in 1892, and the surveys were made to Carlyle, about 20 miles, and for some distance south of that town.

Chippewa Falls & Northern.—Samuel Crabbe, of Eau Claire, Wis., who has recently become Chief Engineer of this line, proposes to begin a survey next week from Chippewa Falls to Cadott, Wis., about 10 miles, and it is said the line will then be continued to River Falls, Wis. The charter of the company is for a line from Chippewa Falls north to Lake Superior.

Crystal River.—Late spring snows have greatly retarded the work on the grading from a point near Carbondale, Col. Seven miles of rails have been laid up Rock Creek, or Crystal River, as it is now known. The line will be finished to the junction of Coal Creek and Crystal River, and the 13-mile branch up Coal Creek will be finished by the middle of summer. The coke to be made at the junction point will be of the finest quality. A further extension up to Crystal camp is contemplated.

Duluth & Iron Range.—The engineers are still in the field completing the survey of the new short line between Two Harbors, Minn., and the Mesaba iron range.

Ebensburg & Black Lick.—Contractor Charles MacFadden has the grading well under way on this railroad, which is being built as a branch of the Pennsylvania, through the timber and coal mines in the Black Lick region in Indiana County, Pa. It is stated that 800 men will be at work on the line during this month. The branch is to extend from the Cambria & Clearfield road across the county to Black Lick station, a distance of about 30 miles.

Elkhart & Western.—The contract for grading the line from Elkhart west to Mishawaka, Ind., was let on April 3 and the officers expect to begin the grading this week. The line now under construction is about 20 miles long and is to be completed and in operation by July 1, next. Connections are made at Elkhart with the "Big Four" road and at Mishawaka with the Chicago & Grand Trunk. H. E. Bucklen is President of the company and E. C. Bickel, of Elkhart, is General Manager.

Elk Mountain.—The directors have been expending of late about \$20,000 in buying up rights of way along Rock Creek or Crystal River, in Colorado, to complete their holdings so that the negotiations for placing bonds may be more readily done. The territory tributary to this line is full of valuable anthracite and bituminous coal deposits, besides much good timber and rich ores.

Fairmount Belt Line.—The belt line at Fairmount, W. Va., being built by the Baltimore & Ohio, has been completed as far as the Beebe glass works, and will be finished to a connection with the main line in a few weeks. The road will be six miles long when opened its entire length.

Florence, Cripple Creek & State Line.—President W. E. Johnson returned last week from New York City, and it is announced, succeeded in placing \$1,000,000 of bonds. A surveying party has been in the field for some weeks making a final survey from Florence, Col. A stamp mill will be erected at Florence for the reduction of Cripple Creek gold ores.

Florida Central & Peninsular.—Col. I. Y. Sage, President of the Southern Supply Company, which has the contract for building the Savannah extension of this road, reports that about 1,800 men are now at work all along the line, principally on the grading. The track laying will begin May 1, as already announced. About 48 miles of the road has been graded up to the present time, the work having been commenced early in January. The grading is very light, and there is little doubt that the line will be completed between Hart's Road, Fla., the southern terminus, and Savannah, Ga., 114 miles, in October. The bridges over four of the principal rivers are draw spans. The length of the spans are as follows: Bridge over Satilla River 666 ft. long, with a 130-ft. draw; at St. Mary's River 420 ft., draw span 144 ft.; at Altamaha River 410 ft., draw span 134 ft.; and at Ogeechee River 342 ft., draw span 114 ft. Besides the draw spans there are 13 fixed spans to build.

Galveston, Sour Lake & Eastern.—J. E. Newton, of Houston, Tex., has organized this company to build a railroad about nine miles long from Sour Lake station to the health resort at the lake, of which he is proprietor. The line will connect with the Southern Pacific at a point near Beaumont station, and when completed will probably be operated by that company. The surveys have been made by W. A. Polk, of Houston, recently Chief Engineer of the Houston, East & West Texas road.

Lehigh Valley.—That portion of the Bear Creek Division between Bear Creek and Meadow Run, Pa., 12

miles, was abandoned on April 1, the timber along the line having been exhausted and the mills abandoned.

Manitoba.—The Government of this Province has rejected the proposal of a company to construct a new railroad line from Winnipeg to Port Arthur, Ont., on the ground that the finances of the Province will not admit of the payment of a subsidy of \$440,000 out of the treasury, as demanded.

Metropolitan West Side Elevated.—Construction on this road, in Chicago, is being rapidly pushed. The surveys on the main line have been completed from Canal street to West Forty-eighth street, and the right of way practically cleared west from Ashland avenue, a distance of four miles. The last condemnation suit on this strip was given to the jury last week. Foundations for about 200 columns are now in and shipments of iron have been made from the works of the Keystone Bridge Co. Quite a large part of the right of way between Ashland avenue and Canal street has already been secured by purchase, and condemnation suits will soon begin on the remainder. The surveys have been completed as far west as Kedzie avenue on the Milwaukee avenue branch, the Humboldt Park branch, and the Douglas Park branch.

Midland Terminal.—R. Newell, Jr., Manager of the road, states that work will be resumed upon the road about April 20. It will probably be completed to Cripple Camp in June. Rails will be laid at once on the section already graded between Midland and Hayden Divide, Cal., so that it may be used in transporting building material for the remainder of the road.

Minneapolis, St. Paul & Sault Ste. Marie.—The extension from Valley City, N. D., to a connection with the Canadian Pacific is to be completed this year. Work on this line will be recommenced as soon as the weather permits. The road is now graded for 28 miles beyond Cathay, leaving 150 miles to grade to reach the international boundary line.

Montford Colonization.—Tenders will be received by the Secretary, E. D. Porcheron, 1688½ Notre Dame street, Montreal, until April 15, for grading 13 miles of this road between Lachute, Quebec, and St. Sauveur, Quebec. This company has a subsidy of \$67,200 from the Canadian Parliament for the 21 miles of road from Lachute, on the Canadian Pacific, northeast to St. Sauveur, on the Montreal & Western, and about 10 miles has been graded. The road will be narrow gauge.

Montreal Island Loop.—President O. M. Auge, of Montreal, has filed the plans for this proposed line with the City Clerk at Montreal. The company proposes to build a belt line through the city of Montreal and through the various municipalities on Montreal Island. A portion of the proposed line in the city limits is to be an elevated structure.

Natchitoches.—President L. Caspari, of Natchitoches, La., states that a preliminary survey will be made during the summer for an extension through the Red River Valley from Grand Ecore northwest toward Shreveport, La. He expects free right of way and cash subsidies, and has submitted a proposition for such aid to citizens of Shreveport.

New Hampshire Roads.—Bills have been introduced in the legislature to incorporate the Upper Ammonoosuc and the Ossipee Valley lines. A bill has also been introduced authorizing the Franklin & Tilton to increase its stock to a sum not exceeding \$50,000.

New Road.—The Kentucky Fire Brick Company is interested in the construction of a narrow gauge road now being built up Berry's Branch from near Olive Hill, Ky. The road will extend to clay fields owned by the company in Carter County, about seven miles from the town of Olive Hill.

J. W. Barrett, of Houston, Tex., is building a railroad from the International & Great Northern south of Houston, to deep water on Trinity Bay for a Duluth, Minn., company. The new line begins 11 miles south of Houston near the station of Dumont, and extends four miles to Shoal Point, on Trinity Bay, where it is proposed to build extensive wharves.

Norfolk & Western.—The company has passed the semi-annual dividend usually declared in March and paid in April. The directors, in passing the dividend, adopted the following resolution: Whereas, The net income for the year ending Dec. 31, 1892, after providing for all fixed charges, shows a surplus applicable to dividends of \$720,313, or, after deducting the dividend of one per cent. paid in October, for the six months ending June 30, 1892, there remained a balance of \$200,313; therefore, Resolved, That the usual semi-annual dividend be not declared, and that the net earnings be applied to liquidating current obligations, including those incurred in the construction of the Ohio extension, now completed.

Ohio & Mississippi.—The contract for the extension of the Cincinnati and Bedford branch, from a point at Mitchell Hollow to a connection with the Bedford belt line at Bedford, Ind., has been let to Morris, Serpell & Co., of Louisville, Ky. Work will begin this week.

Philadelphia, Honesdale & Albany.—The company filed articles of incorporation at Albany, N. Y., this week for the New York Division of the line, the route given in the charter being from the Pennsylvania state line at Hancock, Delaware County, northeast to Albany, 137 miles. The southern terminus of the road as given in the Pennsylvania charter, filed a few weeks ago, is White Haven, Pa., and preliminary surveys are being made from that town. F. F. Whittekin, of Tionesta, Pa., is Chief Engineer and one of the directors. L. H. Taylor, Jr., of Philadelphia and E. S. Lawrence, of Honesdale, Pa., are also directors.

Pittsburgh, Ohio Valley & Cincinnati.—It is stated that this line, which is now in operation from Bellaire, along the Ohio River to Powhatan, O., 15 miles, will be pushed towards Marietta, O., 60 miles, with the intention of getting the line completed that far this season. A part of the grading on the lower end of the line was done years ago, and to-day there are large trees on the right of way that have grown there since the grading was done. The road is controlled by the Pennsylvania and the part that is in operation is proving very successful, but would be enhanced in value by the completion of the lower end.

Reclamation Railway & Terminal Co.—A charter was filed at Topeka, Kan., last week for a company organized under this name which proposes to reclaim submerged lands in the Missouri River Valley, to improve the navigation of that river, to erect bridges and to build railroad lines in Wyandotte, Kan., and through Jackson and Clay counties, Mo.

Scranton & Abington.—A charter for this company was filed at Harrisburg, Pa., last week, the line proposed extending from Scranton to Waverly, Pa., about nine miles.

Texas, Louisiana & Western.—President C. B. Putnam has recently returned to Houston from the East, where he is understood to have arranged for the completion of this line to Trinity River. About 25 miles of the road has been completed to Cleveland station, on the Houston, East & West Texas road, and about 15 miles of roadbed has been graded east of that town toward Trinity River, and the rails have been purchased. A branch north to Cold Springs will be built this summer to reach stone quarries at that point. The main line extends through an excellent timber country.

Tuscaloosa Northern.—The negotiations between the Tuscaloosa Coal, Iron & Railroad Company and J. W. Woolfolk, of the Montgomery, Tuscaloosa & Memphis road, for the construction of the Tuscaloosa Northern and Tuscaloosa Belt road, announced a few weeks ago, were completed at Tuscaloosa, Ala., last week. Mr. Woolfolk, it is stated, has purchased the franchises and will compete the lines during the summer. The first division of the Tuscaloosa Northern to be built will probably be the 20 miles between Tuscaloosa and the Maxwell mines, in the Warrior coal fields, northwest of the town, which are owned by the coal and iron company.

Wheeling Bridge & Terminal.—The company has let the contract for the trestling and piling on the Benwood extension, to Hallcock Brothers, of Wheeling, W. Va. The contract for the grading and other work has not been let yet, but will be within two weeks. It is the desire of the company to get the line completed as soon as possible, and the work will be pushed with all possible vigor. The extension will be about five miles in length and will follow the Ohio River bank almost all the way. The right of way, throughout, is in the city of Wheeling and the suburb of Benwood and the line will be expensive to build. The right of way has been nearly all secured, most of it through appraisers appointed by the courts. A very considerable portion of the road will be built upon piling. The desire is to reach large iron and steel industries that will furnish heavy freights to the terminal system.

GENERAL RAILROAD NEWS.

Atchison, Topeka & Santa Fe.—The comparative statement of operations for the month of February and for the eight months of the fiscal year is as follows:

Month of February.	1893.	1892.	Inc. or dec.
Aver. operated mileage.....	7,130	7,127	I.
Gross railroad earn.....	\$2,844,580	\$2,622,018	I. \$222,571
Oper. expenses.....	2,173,263	2,078,156	I. 95,107
Net earn.....	\$671,326	\$543,862	I. \$127,464
Other receipts.....	75,000	75,000	
Total net earn.....	\$746,326	\$618,862	I. \$127,464
One-twelfth fixed charges.....	850,000	820,000	
Deficit.....	\$103,674	\$231,138	D. \$127,464

Eight Months to Feb. 28.	1893.	1892.	Inc. or dec.
Aver. operated mileage.....	7,130	7,122	I. 8
Gross railroad earn.....	\$28,432,974	\$21,732,439	I. \$1,700,535
Oper. expenses.....	18,105,264	17,156,056	I. 919,208
Net earn.....	\$8,327,710	\$7,576,383	I. \$751,327
Other receipts.....	600,000	600,000	
Total net earn.....	\$8,927,710	\$8,176,383	I. \$751,327
Eight-twelfths ann. fixed charges, (est.).....	6,800,000	6,800,000	
Surplus.....	\$2,127,710	\$1,376,383	I. \$751,327

The earnings for the same periods, including the earnings of the St. Louis & San Francisco and the Colorado Midland, are as follows:

AGGREGATE GENERAL SYSTEM.	Month of February.	1893.	1892.	Inc. or dec.
Aver. operated mileage.....	9,344	9,312	I.	2
Gross railroad earn.....	\$3,638,880	\$3,424,368	I. \$214,512	
Oper. expen	2,782,727	2,641,382	I. 138,345	
Net earn	\$856,153	\$79,986	I. \$76,167	
Receipts.....	75,000	75,000		
Total net earn.....	\$931,153	\$85,986	I. \$76,167	
One-twelfth ann. fixed charges, (est.).....	1,194,000	1,192,000	I. 2,000	
Deficit.....	\$262,848	\$337,015	D. \$74,167	

Eight months to Feb. 28.	1893.	1892.	Inc. or dec.
Aver. operated mileage.....	9,344	9,336	I. 8
Gross railroad earn.....	\$34,285,907	\$32,188,837	I. \$2,106,370
Oper. expen	23,353,631	21,908,051	I. 1,445,580
Net earn.....	\$10,931,576	\$10,280,736	I. \$650,790
Receipts.....	600,000	600,000	I.
Total net earn.....	\$11,531,576	\$10,880,736	I. \$650,790
Eight-twelfths ann. fixed charges, (est.).....	9,552,000	9,536,000	I. 16,000
Surplus.....	\$1,979,576	\$1,344,736	I. \$634,790

Atlanta & Florida.—Judge George Clark, of the Georgia Supreme Court, has ordered the sale of this road on May 2, in the foreclosure proceedings already described in these columns.

Central of New Jersey.—The earnings for February and the two months of the year are reported below:

	1893.	1892.	Inc. or dec.
Gross earn.....	\$1,100,655	\$1,138,333	D. \$37,678
Oper. expen.....	686,323	632,618	I. 35,705
Net earn.....	\$414,332	\$505,715	D. \$91,383

Jan. 1 to Feb. 28:	1893.	1892.	Inc. or dec.
Gross earn.....	\$2,161,437	\$2,112,638	I. \$51,799
Oper. expen.....	1,412,501	1,258,370	I. 154,131
Net earn.....	\$751,936	\$854,268	D. \$102,332

Clearfield & Mahoning.—A formal lease of this road to the Buffalo, Rochester & Pittsburgh was authorized by the stockholders last week, and copies of the lease have been filed in Pennsylvania. The annual rental under the lease is \$71,500, being six per cent. on mortgage bonds for \$650,000, and five per cent. interest on a second mortgage for a similar amount. The road is now being built by the Buffalo, Rochester & Pittsburgh from a point on its line near Du Bois across Clearfield County to Clearfield, Pa., 26 miles.

Chicago & Northern Pacific.—On April 2 this road began operating its new suburban branch, to be known as the Chicago Central Division, which leaves the main line at Ogden and Western avenues in Chicago and extends south along Western avenue to Blue Island, and thence southeast to Harvey, Ill. A second track with rock ballast has been completed to Blue Island and the extension to Harvey will be ready for traffic in about two weeks. The south branch of the Chicago River is crossed at Thirty-fifth street by a new bridge. There will be 15 new stations on this branch, nine of which are completed and the other six have been commenced. The country through which this road runs is not developed, but an effort will now be made to improve the property, as it is well adapted for suburban residences. This branch, with the Baltimore & Ohio connection, will furnish residents of the west side with transportation facilities to the World's Fair. The route to the Exposition grounds will be over the Chicago & Northern Pacific to Seventy-fifth street, where the Baltimore & Ohio crosses, and east over this latter road to South Chicago, then north to Jackson Park.

Chicago & Western Indiana.—This road has recently completed an extensive addition to its property holdings in the downtown portion of Chicago. By a series of purchases aggregating \$600,000 it has secured control of the Custom House place frontage opposite the Dearborn street station block, from the corner of Taylor street north 500 ft. When the right of way purchases were being made a few years ago the company bought a number of frontages north of Polk street, on either side of Dearborn, and a frontage of 50 or 75 ft. on Clark street. The northern limit of the railroad holdings is now about 300 ft. south of Polk street. All the purchases are improved with some sort of structure, but these will be cleared away as the railroad company has arranged for immediate possession. The officers of the road decline to give any information as to the use to be made of the property, but it is supposed that it will be used in an extension of the terminal freight facilities of the road. The corresponding half block south of Taylor street is now occupied by freight yards and warehouses and these, it is said, will be extended across Taylor street 500 ft. north. At the same time that the Western Indiana has been in the market making these purchases, the Elevated Terminal Co. has offered for sale its block of State street frontage, between Twelfth and Taylor streets.

Hoosac Tunnel & Wilmington.—At a meeting of the stockholders of the road at Holyoke, Mass., April 1, it was decided to increase the capital stock of the company from \$210,000 to \$250,000, and to issue bonds to an amount not exceeding the latter sum. Owing to some error in the mortgage of the road held by the Old Colony Trust Company, it was voted to discharge the mortgage.

Lehigh Valley.—The statement of the operations of the lessee for January, and for the two months ending Jan. 31, is as follows:

	1893.	1892.	Inc. or dec.
Gross earn.....	\$1,293,015	\$1,292,454	D. \$9,439
Oper. expenses.....	1,156,365	1,142,401	I. 13,964
Net earn.....	\$126,650	\$159,053	D. \$23,402
Two months ending Jan. 31:			
Gross earn.....	\$3,043,569	\$2,902,688	I. \$140,881
Oper. expenses.....	2,327,446	2,351,704	D. 24,258
Net earn.....	\$716,123	\$550,984	I. \$165,139

Louisville & Nashville.—The financial statement for February is printed below:

Month of February:	1893.	1892.	Inc. or dec.
Gross earn.....	\$1,817,583	\$1,784,656	I. \$32,912
Oper. expenses.....	1,108,414	1,093,916	I. 14,468
Net earn.....	\$709,154	\$690,710	I. \$18,444
Eight months to Feb. 28:			
Gross earn.....	\$15,360,166	\$14,427,413	I. \$932,753
Oper. expenses.....	9,452,069	9,276,084	I. 175,985
Net earn.....	\$5,908,097	\$3,151,329	I. \$275,768

Philadelphia & Reading.—The February earnings of the railroad system were issued last week, and are given in the following tables:

Month of February:	1893.	1892.	Inc. or dec.
Gross earn.....	\$1,631,347	\$1,788,774	D. \$157,427
Oper. expen.....	1,207,184	1,025,967	I. 181,217
Net earn.....	\$421,163	\$762,897	D. \$338,644
Other income.....	18,056	35,997	D. 17,941
Total net earn.....	\$442,219	\$798,804	D. \$356,585
Improvements.....	3,213	9,541	D. 6,328
Balance.....	\$439,006	\$79,263	D. \$350,257
Fixed charges.....	650,000	625,840	I. 24,160
Deficit.....	\$210,994	\$ur. \$163,423	I. \$374,417

The statements of the railroad of the Coal & Iron Co. for three months to Feb. 28 are as follows:

Railroad Company:	1893.	1892.	Inc. or dec.
Gross earn.....	\$5,105,494	\$5,397,510	D. \$292,016
Net.....	1,773,000	2,560,663	D. 787,663
Deficit.....	241,365	Sur. 619,418	I. 860,783

Coal & Iron Co.:

	1893.	1892.	Inc. or dec.
Gross earn.....	\$12,084,376	\$5,094,491	I. \$6,989,885
Loss.....	17,798	Profit 46,223	L. 222,021

Deficit.....

379,798 150,276 L. 229,522

Both companies for the three months show a net decrease of \$1,009,685 and a deficit after charges of \$621,163, against a surplus of \$469,142, a loss of \$1,090,305.

Wabash.—The reports of earnings continue to show decreases in gross earnings, but the net earnings in February show a slight increase in net earning owing to a reduction of \$72,000 in operating expenses. The statements follow:

February	1893.	1892.	Inc. or dec.
Gross earn.....	\$1,019,845	\$1,087,850	D. \$88,005
Oper. expen.....	793,441	865,698	D. 72,257
Net earn.....	\$226,404	\$222,152	I. \$4,252
July			